OPNAVINST 5100.19C
19 JANUARY 1994

NAVY

OCCUPATIONAL SAFETY AND HEALTH

(NAVOSH)

PROGRAM MANUAL

FOR FORCES AFLOAT

OPNAV INSTRUCTION 5100.19C
VOLUME II
SURFACE SHIP SAFETY STANDARDS

DEPARTMENT OF THE NAVY

OFFICE OF THE CHIEF OF NAVAL OPERATIONS

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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

OPNAVINST 5100.19C
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OPNAV INSTRUCTION 5100.19C, VOLUME II

From: Chief of Naval Operations

Subj: NAVY OCCUPATIONAL SAFETY AND HEALTH (NAVOSH) PROGRAM MANUAL FOR FORCES AFLOAT, VOLUME II

Encl: (1) Navy Occupational Safety and Health Program Manual for Forces Afloat, Volume II

1. Purpose. To provide the second volume of the Navy Occupational Safety and Health Program Manual for Forces Afloat.

2. Discussion

a. This volume provides the surface ship safety standards and precautions necessary to carry out the program established in Volume I.

b. To aid in determining changes made from OPNAVINST 5100.19B, paragraphs which have been modified, added or, deleted are appropriately marked.

3. Action

a. Replace the current Volume II of OPNAVINST 5100.19B with enclosure (1).

b. Each command should have sufficient copies enclosure (1) to ensure that personnel in each work center have access to the information. If sufficient copies are not provided in the initial distribution, they should be requested from the distribution control point.

4. Forms. The following forms may be ordered from the Navy Supply System per NAVSUP P2002:

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STEPHEN F. LOFTUS
Deputy Chief of Naval
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TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS

Chapter	Title	Page
C1	BASIC SAFETY	
	C0101 Discussion	C1-1
	C0102 General Safety Standards	C1-1
	C0103 Training	C1-4
	C0104 Safety Color Code for Marking Physical Hazards	C1-4
C2	DRY CARGO OPERATIONS	
	C0201 Discussion	C2-1
	C0202 Precautions - Cargo Handling for Supervisors	C2-1
	C0203 Precautions During Cargo Operations	C2-4
	C0204 Stowage Precautions	C2-6
	C0205 Booms	C2-7
	C0206 Cranes	C2-9
	C0207 Hooks	C2-12
	C0208 Chainfalls and Come-a-longs	C2-12
	C0209 Nets	C2-14
	C0210 Pallets	C2-14
	C0211 Slings	C2-15
	C0212 Elevators	C2-17
	C0213 Conveyors	C2-18
C3	UNDERWAY REPLENISHMENT	
	C0301 Discussion	C3-1
	C0302 Precautions to be Observed Prior to UNREP Operations	C3-1
	C0303 Precautions During UNREP Operations	C3-3
C4	SMALL BOATS	
	C0401 Discussion	C4-1
	C0402 Precautions for Launching and Retrieval	C4-1
	C0403 Small Boat Fueling	C4-2
	C0404 Operations	C4-3
	C0405 Contract Liberty Boat Safety	C4-5 (A
C5	WIRE AND FIBER ROPE	
	C0501 Discussion	C5-1
	C0502 General Precautions	C5-1
	C0503 Natural Lines	C5-2
	C0504 Synthetic Lines	C5-4
	C0505 Wire Rope	C5-4

TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS
(Continued)

Chapter	Title	Page
C6	GROUND TACKLE AND TOWING	
	C0601 Discussion	C6-1
	C0602 Ground Tackle Precautions	C6-1
	C0603 Towing Precautions	C6-4
	Chapter C6 References	C6-6
C7	HELICOPTER OPERATIONS	
	C0701 Discussion	C7-1
	C0702 Precautions	C7-1
	C0703 Refueling Precautions	C7-3
C8	WORKING OVER THE SIDE OR ALOFT; DRY DOCK SAFETY	
	C0801 Discussion	C8-1
	C0802 General Precautions	C8-1
	C0803 Additional Precautions for Working Over the Side	C8-2
	C0804 Personnel Working Aloft	C8-3
	C0805 Dry Dock Safety Precautions	C8-3
	Appendix C8-A Working Aloft Check Sheet	C8-A-1
	Appendix C8-B Working Over the Side Check Sheet	C8-B-1
C9	ELECTRICAL AND ELECTRONIC SAFETY AND TAG-OUT PRECAUTIONS	
	C0901 Discussion	C9-1
	C0902 Definitions	C9-1
	C0903 Electrical Precautions	C9-1
	C0904 Batteries	C9-4
	C0905 Electrical Fires	C9-6
	C0906 First Aid for Electrical Shock	C9-7
	C0907 Electronic Precautions	C9-8
R)	C0908 Tag-out Precautions	C9-10
C10	SHIPBOARD FUELS	
	C1001 Discussion	C10-1
	C1002 Precautions	C10-1

TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS
(Continued)

Chapter	Title	Page	
C11	WELDING, CUTTING, AND BRAZING		
	C1101 Discussion	C11-1	
	C1102 Precautions	C11-2	(R
	C1103 Extra Precautions for Work in Restricted Access Spaces	C11-6	
C12	SHIPBOARD AIRCRAFT SAFETY		
	C1201 Discussion	C12-1	
	C1202 General Fire Precautions	C12-1	
	C1203 Housekeeping	C12-2	
	C1204 Foreign Object Damage (FOD)	C12-2	
	C1205 Lighting in Hangar Deck and Shop Spaces	C12-3	
	C1206 Aircraft Crash and Rescue	C12-3	
	C1207 Movement of Aircraft	C12-3	
	C1208 Servicing and Ground Testing	C12-4	
	C1209 Engine Operations	C12-5	
	C1210 Liquid Oxygen	C12-6	
	C1211 Arresting Gear and Barricades	C12-8	
	C1212 Catapults	C12-8	
C13	MACHINERY		
	C1301 Discussion	C13-1	
	C1302 General Precautions	C13-1	
	C1303 Maintenance	C13-3	
	C1304 Boilers	C13-3	
	C1305 Industrial Equipment	C13-10	
	C1306 Shipboard Incinerators	C13-23	(A
C14	ORDNANCE		
	C1401 Discussion	C14-1	
	C1402 General Ordnance Precautions	C14-1	
	C1403 Ordnance Handling Precautions	C14-4	
	C1404 Ordnance Stowage Precautions	C14-7	

TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS
(Continued)

Chapter	Title	Page
C14	ORDNANCE (Cont'd)	
	C1405 Ordnance Firing and Launching Precautions	C14-8
	C1406 Ordnance Assembly, Testing, and Maintenance Precautions . . .	C14-12
	Chapter C14 References	C14-13
C15	MARINE SANITATION DEVICES (SEWAGE SYSTEMS)	
	C1501 Discussion	C15-1
	C1502 Sanitary, Hygienic, and Safety Procedures	C15-1
	C1503 Gas Free Engineering for MSD Systems	C15-4
	C1504 Sewage Collection, Holding, and Transfer (CHT) System .	C15-5
	Chapter C15 References	C15-8
C16	HEAVY WEATHER	
	C1601 Discussion	C16-1
	C1602 Lifelines	C16-1
	C1603 Tie-Downs	C16-2
	C1604 Safety Precautions Under Heavy Weather Conditions	C16-2
C17	ABANDONING SHIP	
	C1701 Safety Precautions During Abandoning Ship	C17-1
C18	PAINTING AND PRESERVATION	
	C1801 Discussion	C18-1
R)	C1802 Safety Precautions For Surface Preparation and Painting Operations . .	C18-1
A)	C1803 Safety Precautions For Paint Removal	C18-3
C19	FOOD PREPARATION AND SERVING FACILITIES	
	C1901 Discussion	C19-1
	C1902 General Precautions	C19-1
	C1903 Cooking Utensils	C19-2
	C1904 Food Preparation	C19-3
	C1905 Safe Operation of Equipment	C19-4

TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS
(Continued)

Chapter	Title	Page
C20	LAUNDRIES, DRY CLEANING PLANTS, AND PHOTOGRAPHY	
	C2001 Discussion	C20-1
	C2002 Precautions Relating to Laundry and Dry Cleaning Equipment	C20-1
	C2003 Precautions for Solvents and Cleaners	C20-3
	C2004 Bleaches	C20-3
	C2005 Precautions for Lithographic, Photographic and Radiographic Darkrooms and Laboratories	C20-4
C21	MEDICAL AND DENTAL FACILITIES	
	C2101 Discussion	C21-1
	C2102 Safety Precautions for Medical Facilities	C21-1
	C2103 Safety Precautions for Dental Facilities	C21-6
C22	DIVING OPERATIONS NEAR SHIPS	
	C2201 Discussion	C22-1
	C2202 Diving Operations Precautions	C22-1
	Appendix C22-A Divers Over the Side Check Sheet	C22-A-1
C23	HAZARDOUS MATERIAL STORAGE, USE, AND DISPOSAL PRECAUTIONS	
	C2301 Discussion	C23-1
	C2302 General Storage Requirements	C23-1
	C2303 General Handling and Use Requirements	C23-2
	C2304 HAZMINCEN Procedures	C23-3 (A
	C2305 Flammable and Combustible Material	C23-5 (R
	C2306 Toxic Material	C23-7 (R
	C2307 Corrosive Materials	C23-10 (R
	C2308 Oxidizers	C23-11 (R
	C2309 Aerosols	C23-14 (R
	C2310 Compressed Gases	C23-15 (R
	Appendix C23-A Hazardous Material Compatibility Storage Diagram	C23-A-1 (A

TABLE OF CONTENTS
VOLUME II
SECTION C

SURFACE SHIP SAFETY STANDARDS
(Continued)

	Chapter	Title	Page
A)	C24	CO2 FIXED FLOODING SYSTEM SAFETY PRECAUTIONS AND PROCEDURES	
		C2401 Discussion	C24-1
		C2402 Health Hazards of Carbon Dioxide	C24-1
		C2403 Safety Precautions	C24-2
		C2404 General Procedures During Maintenance Work	C24-3
		C2405 Disabling Procedures	C24-4
		C2406 Rescue Personnel Procedures	C24-4

Section C

SAFETY STANDARDS

This section contains basic safety requirements that are applicable to shipboard activities and/or equipment. It may be necessary when conducting operations and maintenance on specific systems or equipments to consult other Navy publications such as the Naval Ships Technical Manual, Naval Warfare Publications, technical/operating manuals and equipment Planned Maintenance System (PMS) cards for complete safety precautions. This section is addressed to the individual deckplate sailor and his/her supervisor. It must also be recognized that there may be conditions that are not covered in this manual. If a NAVOSH standard does not exist, the Type Commander shall be notified via the chain of command. The Type Commander considering the chain of command input will determine if there is an applicable OSHA standard and how the OSHA standard shall apply considering if there are military unique requirements/ design configurations that prevent compliance with OSHA standards. The Type Commander or other commander in the chain of command, if knowledgeable, shall provide guidance to all ships under his command as to the standards to be followed.

CHAPTER C1

BASIC SAFETY

C0101. DISCUSSION

a. Shipboard life is one of the more hazardous working and living environments that exist. The existence of hazardous materials and equipment, in addition to the fact that a ship is a constantly moving platform subject to conditions such as weather, collision, and grounding contribute to an accident prone environment. Any chain of mishaps could lead to a major catastrophe. It is for this reason, PRACTICAL SAFETY must be followed and the prescribed safety regulations strictly followed to prevent personal injury and illness.

b. The general safety standards in the following section are applicable to all shipboard operations and spaces.

C0102. GENERAL SAFETY STANDARDS

Complying with the following standards may save your life:

a. Locate and remember all exits from working and living spaces that you frequent.

b. Know where life jackets are stored in or near your working and living spaces.

c. Make sure that all movable objects in your spaces are secured or lashed down.

d. Always wear clothing that snugly fits your body. Wear short sleeves (R
or roll up sleeves when operating rotating industrial machinery.

e. Whenever practicable carry a load in a manner which allows one hand to be free.

f. Always move up or down a ladder with one hand on the railing. Never (R
slide down inclined ladders.

g. Know the emergency shut down procedures for all equipment you use.

h. Always ensure exits are not blocked with equipment or boxes.

i. Always ensure ventilation ducts are free of blockage. Never alter (R
ducts or diffusers without permission.

j. Horseplay is dangerous anywhere aboard ship.

k. Rings, watches, key rings, and other items that may become entangled or caught on projections should not be worn.

l. Always wear approved safety shoes when required by the job.

m. Carry as little in your pockets as possible.

n. Walk, don't run in passageways.

o. Always be cautious when nearing a "blind" corner.

p. Know the location of all lifeboat and life raft stations and know how to proceed to them from the living and working spaces you frequent.

q. Know the location of all fire stations and other firefighting equipment in or near the living and working spaces you frequent.

r. Keep constantly familiar with the whereabouts of crew members in the space where you are working, especially if they are working in tanks, voids or other restricted movement areas.

s. Smoke only in designated areas.

t. Equipment shall be used only by authorized personnel and in an authorized manner.

u. Sunglasses shall only be worn topside.

v. If you pass through a watertight door designated to be closed during normal operations, be certain that it is properly closed and dogged.

w. Know where all life rings, watermarkers, and flares are located for man overboard emergencies.

x. Know all areas where protective equipment should be worn.

y. Promptly inform senior personnel responsible for a given space or equipment of all unsafe conditions discovered.

z. Do not lean against lifelines.

aa. Keep decks free of obstacles and materials causing slippery conditions, particularly in work areas. Areas that are slippery shall be posted with a warning sign. Ensure non-skid is installed around machinery work areas.

ab. Provide temporary protection by guardrails or chains, suitably supported by stanchions or pads, when opening accesses in bulkheads or decks which are normally closed.

ac. Never straddle or step over lines, wire, and chains under tension.

ad. After opening and prior to passing through a watertight hatch, scuttle, or manhole cover ensure hatch brace pins and/or safety pawls and scuttle/manhole covers are positively locked.

ae. Wear a life-jacket topside where the potential exists of falling, slipping, being thrown or carried into the water.

af. Never lock escape scuttles so they cannot be opened from the inside.

ag. Never dismantle or remove any lifeline, or hang or secure any weight or line to any lifeline except as authorized by the commanding officer.

ah. Never dismantle any permanent lifeline system without permission of the commanding officer and without providing temporary lifelines.

ai. Never dismantle or remove any inclined or vertical ladder without permission of the commanding officer. Such areas shall be secured with temporary lifelines and shall be posted with a warning sign.

aj. Never operate machinery or equipment with defective safety devices without specific permission of the commanding officer.

ak. Never tamper with or render ineffective any safety device, interlock, ground strap or similar device intended to protect operators or the equipment without specific approval of the commanding officer.

al. Never open or close electrical switches and pipe valves unless authorized to do so.

am. Ensure that low overheads above inclined ladders (72") and passageways (75") and obstructions in passageways are padded, and hazardous areas around machinery and elevators are color coded to warn people of danger areas.

an. Rig heavy weather lifelines prior to expected inclement weather.

ao. When working in a tank or void, ensure that you have a safety line attached.

ap. Only wear portable stereo earphones while in your rack or in the (A
berthing spaces. Portable stereo earphones shall not be worn while performing work aboard ship or while transiting throughout the ship.

aq. Never open or enter a tank, void, or manhole before obtaining permission (A
from the gas free engineer.

ar. Never tamper with any damage control fittings or equipment. (A

C0103. TRAINING

a. While most of the standards specified in this chapter are covered during basic training and at specific training schools, a new crew member upon reporting on board should be given a copy of these standards and a brief orientation as to their intent and importance.

b. Every time a mishap occurs involving a violation of one of these standards, all personnel should have the appropriate standard again brought to their attention. This can be accomplished through the use of Plan of the Day notes or divisional training at quarters.

C0104. SAFETY COLOR CODE FOR MARKING PHYSICAL HAZARDS

a. **Red**. Red shall be the basic color for the identification of:

(1) Fire protection equipment and apparatus.

R) (2) **Danger**. Safety cans or other approved portable containers of flammable liquids (see C2304) shall be painted red with some additional clearly visible identification either in the form of a yellow band around the can or the name of the contents conspicuously stenciled or painted on the can in yellow. Danger signs shall be painted red, black, and white.

(3) **Stop**. Emergency stop bars on hazardous machines, such as rubber mills, wire blocks or flat work ironers, shall be red. Stop buttons or electrical switches on which letters or other markings appear and are used for emergency stopping of machinery shall be red.

b. **Yellow**. Yellow shall be the basic color for designating caution and for marking physical hazards such as: striking against, stumbling, falling, tripping, and "caught in between." Solid yellow, yellow and black stripes with suitable contrasting color should be used interchangeably, using the combination which will attract the most attention in the particular environment.

A) c. **Green**. Green shall be the color of general safety information signs.

CHAPTER C2

DRY CARGO OPERATIONS

C0201. DISCUSSION

a. Dry cargo is any cargo that is carried in its own container and is not in bulk form, such as fuel. Examples of dry cargo are stores, equipment and machinery that is carried in a ship for its own or another vessel's use.

b. This chapter does not include underway replenishment (UNREP) operations or refueling at sea (FAS) operations except fuel used in drums or other approved containers. UNREP and FAS operations are covered in other chapters.

c. Dry cargo handling evolutions are extremely dangerous, even though they appear routine. Cargo being handled in any manner can fall or shift, causing injury to personnel and damage to the vessel. Additionally, hazardous material cargo that is damaged often causes illness or death in extreme conditions. Cargo handling gear can fail, causing not only cargo damage, but the failed cargo handling gear can itself maim and even kill, as well as cause physical damage. It is for these reasons that extreme care must be used during cargo handling operations.

C0202. PRECAUTIONS - CARGO HANDLING FOR SUPERVISORS

The following precautions are for cargo handling supervisors and must be initiated by these personnel before beginning any cargo handling operations:

a. Ensure open hatches in use are cleared of adjacent loose equipment which might fall into the hold and injure personnel below.

b. Restrict traffic about hatches to the side away from where cargo is being worked. Rope off areas to traffic over which loads are travelling.

c. Secure or remove hatch beams or other structures in the way of hatches where cargo is being worked. Personnel engaged in moving hatch beams shall wear a safety harness and associated safety lines which shall be tended at all times.

d. Ensure that all personnel handling cargo gear, especially boom and crane operators, are familiar with the use of their equipment and limitations on load capacity and outreach and are personnel qualifications standard (PQS) certified.

e. Ensure that signalmen are designated and posted when the crane or boom operator does not have a clear field of vision of all aspects of the cargo transfer and ensure that the signalmen are trained in the use of both visual and voice transmitted cargo transfer signals.

f. Ensure that all cargo gear is positioned correctly.

g. Ensure that all cargo to be worked does not exceed the crane's or booms' safe working load.

h. Ensure that there are no obstructions to cargo movement.

i. Ensure that all cargo lines, blocks, shackles, gear, and equipment are in good working condition and are of the proper type and strength required.

j. Ensure that the correct fire equipment, including respiratory protection equipment necessary to put out the class of fires common to the cargo being handled, is within easy reach of cargo handlers.

k. Verify that all designated cargo handlers are wearing the required personal protective equipment, including gloves (when handling wire rope or banded material), hard hats, and safety shoes. Ensure all other personnel immediately involved in the cargo handling operations, i.e. safety observer, rig captain, signalmen, winch operator, and winch checker, including personnel observing for training, wear a hard hat with the chin strap in place under the chin.

l. Ensure that all cargo holds to be used are open and hatch covers properly stowed. All hinged or folding cargo hatches, normally stowed in an upright position shall be secured with hatch securing pawls and safety preventer chains engaged.

m. Visually verify that all pallets and containers are of the correct type and safe for the use intended. If a pallet appears unsafe, it must be discarded or repaired and re-certified.

n. Inspect the cargo handling area and ensure that dunnage is properly stowed clear of all proposed cargo handling activity.

o. Visually check and ensure that all required cargo handling warning signs are properly posted near personnel transit areas.

p. Ensure that all required trim and stability calculations have been completed <u>before</u> the cargo is loaded or off-loaded.

q. Visually check and verify that all cargo boom preventer guys, straps, and whips are rigged correctly.

r. If handling ordnance, ensure that all applicable safety standards are followed and enforced.

s. Use caution when using dock or mobile cranes. Rotary cranes, booms and structures can strike and damage the ship's superstructure.

t. Ensure that all safety suspect cargo handling gear is tagged out of commission, removed, and tested prior to re-issue.

u. Ensure that all holds and levels being utilized have the required safety barriers (rope, chains, nets) installed.

v. Verify that all required cargo (save-all) nets are in place.

w. Ensure there are no oily or slick decks where cargo is to be handled.

x. Ensure adequate lighting is provided at the boom heads, cargo holds, and draft areas when conducting nighttime cargo operations.

y. Do not operate any cargo handling system with inoperative safety devices without the specific approval of the commanding officer.

z. Suspended baskets/buckets shall be rigged per Naval Ships Technical Manual, Chapter 589. Personnel in the basket/bucket shall wear a safety harness with safety lines attached, except when suspended over water where inherently buoyant lifejackets shall be worn. (R

aa. Use correct and well maintained blocks and sheaves for safe load handling operations. The following procedures and safety precautions shall be observed at all times:

(1) Ensure the SAFE WORKING LOAD is stamped on each block.

(2) Before use, inspect blocks and sheaves for defects. Sheaves with corrugated grooves, chips, or excessive wear and blocks with damaged shells, straps, swivels, shackles, eyes, or excessively worn shall not be used.

(3) Never use blocks and sheaves designed for use with fiber rope with wire rope. Attempt to use the right size block or sheave, but oversized blocks and sheaves are preferred to undersized ones.

(4) Blocks and sheaves designed for use with wire rope shall not be used for fiber rope.

(5) Close and hook gate blocks (snatch blocks) before use.

(6) Do not make up hitches with chain or wire rope on a hoist block.

(7) Do not overload blocks and sheaves designed for use with natural fiber ropes when using synthetic fiber ropes.

(8) When the location of fairlead blocks exposes a winch operator or riggers to the bight of the fall/guy, place a preventer on the lead block at the heel of the boom/fairlead block. The preventer shall be 3/4 inch wire rope or larger.

ab. Winches. Label all winch controls, clutch, brake, and pawl levers to indicate function and direction of movement.

(1) Do not operate winches with less than two turns of wire rope on the drum.

(2) Never attempt to lower a load or put winch into "lower" position when the ratchet, pawl or clutch is engaged in the operating position.

(3) Never shift the speed gear lever (or clutch) or the winch drum clutch unless the drum parking brake is set and the drum pawl (if part of the winch) is engaged.

(4) Ensure that the drum parking brake is not released unless the drum clutch lever has been locked in the engaged position and the speed gear lever is locked in either the high or low speed position.

(5) Winches shall not be operated unless the wire rope is properly spooled (i.e., no cross, riding, loose or burned turns).

(6) Ensure winch operators do not leave their positions at the controls until the load has been landed. When leaving a winch, ensure the drum pawl and brake are engaged, the control handle is in the neutral position, and power switch on the controller is in the OFF position.

(7) Ensure all winches used for replenishment at sea have winch wires attached and maintained so the wire can be slipped from the drum in an emergency.

(8) Ensure safety precaution and operating placards, lubrication charts and test label plates are posted on all winches.

(9) Ensure gypsy heads, if installed, are clean and free of gouges, paint, and rust.

A) ac. Ensure there is a qualified safety observer present at all times during cargo handling operations.

A) ad. Conduct an informal safety brief for all participants before the start of first cargo operations after port calls and thereafter as warranted.

C0203. <u>PRECAUTIONS DURING CARGO OPERATIONS</u>

The following precautions should be followed by all personnel during cargo handling operations:

a. Always know where the cargo is during a transfer.

b. Wear a hard hat with chin strap in place under chin, gloves (when handling wire rope or banded material), and safety shoes.

c. When transiting a cargo operations area, walk only in the designated transit areas which are located on the side of the ship opposite the cargo handling operations.

d. Never look into a hold when cargo is being handled or cargo gear is in use unless controlling the movement of the cargo.

e. Never walk under suspended cargo or tensioned highline.

f. Do <u>not</u> ride on pallets, containers, or hooks.

g. Know the firefighting and safety equipment locations.

h. Do not walk backwards.

i. Ensure that safety observers are not involved in any other aspects of cargo handling operations except observing safe procedures.

i. Always listen to equipment. Abnormal sounds usually mean trouble.

j. Use proper equipment for particular cargoes.

k. Never allow cargo to swing or remain suspended for a period longer than necessary.

l. When cargo is being lowered, keep feet and hands clear.

m. If wearing glasses, ensure they are shatterproof.

n. Never allow unsecured cargo gear or equipment to go unattended.

o. Never put hands <u>under</u> cargo during transfer.

p. Never throw anything down a hold or onto a dock.

q . Never step into bights of line.

r. Never grab or hold onto cargo lines.

s. Know the location of all exits from holds.

t. Know the location and use of emergency cut-off switches.

u. Do not oil or lubricate equipment while it is in use.

v. Check cargo handling equipment for damage should cargo being handled strike the cargo handling equipment.

w. Ensure cargo never exceeds cargo handling equipment's listed safe working load limit at the outreach being used.

x. Lift cargo of a questionable weight only after a test lift.

y. If cargo weight is questionable, lift it a few inches above the dock and stop; listen to, and inspect, the cargo handling gear (booms, guys slings, and whips) for unusual sounds or use a dynamometer.

z. Avoid making side pulls.

aa. Never climb up or down exposed ladders when cargo is being handled within the immediate area.

ab. Do not smoke.

ac. Inform supervisors of unsafe or damaged equipment or conditions.

ad. Do not ride on conveyors.

ae. Do not use personnel-only elevators for cargo.

af. Always lift loads evenly.

ag. When suspending a load, only do so over the deck, not the hatch.

ah. Wear faceshields or goggles when removing steel strapping. Have personnel in the area stand to one side and out of the path the strapping will follow when cut.

ai. Do not overload hand and fork trucks. Ensure trucks are below handlers when going up or down an incline.

aj. Remove, repair, or replace defective or broken strapping on cargo.

ak. Loads requiring continuous manual guidance while in motion shall be provided with tag lines.

C0204. <u>STOWAGE PRECAUTIONS</u>

a. Before handling vehicles, inspect and ensure that all fuel has been emptied from the vehicle's tanks with the exception of combat loaded military vehicles.

b. Stow vehicles fore and aft, chock wheels, use approved or installed tie downs or wire rope lashings.

c. Always brace, shore, and lash cargo that may shift.

d. Always preplan the location of material to be stowed so that heavier items are stowed below lighter ones.

e. Use dunnage only when necessary.

f. For specific tiedown information, see the appropriate transportability guidance technical manual.

C0205. BOOMS

a. Properly install, adjust, and maintain boom stays and guys. Ensure all shackles (screw/safety) are seized and/or cotter pins are in place.

b. Where signs of deterioration are found on booms, replace or remove the defective components at the earliest opportunity. If the inspection indicates a dangerous condition or a weakness in any component, report it without delay. Do not operate the boom involved until the equipment has been repaired or replaced.

c. Keep boom guys and preventers as far away from the heel of the boom as possible, but not past the line of the falls. Guy tackles shall be free of twist. Firmly set and equalize guys and preventers to divide the strain. Make preventers fast to the head of the boom, independent of all other fastenings. Keep the slack out of the guys to prevent the boom from swinging while it is being lowered. Always top booms to avoid undue strain on both the boom and the topping lift. Avoid dragging of one fall against the other, without plenty of sag.

d. Before making a heavy lift, tighten all stays, shrouds, and preventers.

e. Handle the guys properly. Do not allow unnecessary slack to develop, or the boom will slap around. Never tighten the guys to the point where the guy tackle may be parted by the strain. While swinging a boom, slack the "following" guy quickly or it may part with disastrous results.

f. Rig preventers on all cargo booms when handling ordnance, nuclear components, and heavy lifts except on booms rigged for traveling.

g. When topping and lowering a boom, emphasize safety. Keep unnecessary personnel out of the area. If necessary, post a watch to warn people away.

h. Whenever a load strikes the boom or the boom strikes an object, the boom shall be lowered immediately and carefully examined for damage.

i. Lift loads only when the lifting cable is in the vertical position. If the load does not ride properly when raised, lower the load and readjust the sling.

j. Ensure that the boom cargo hook is secured fast to a strength member when securing operations for a significant period of time.

k. When a load is suspended from the hook for any period of time, set the winch drum brake and drum pawl. Do not leave the control position while the load is suspended.

l. When a boom is topped up into the working position using a double drummed winch, set the topping drum pawl and drum brake prior to disengaging the topping lift drum clutch, and on single drum topping lift winches, set the drum pawl and drum brake prior to lifting a load, unless the boom is rigged as a travelling boom which requires topping down or up when lifting loads.

m. Engage the pawl and drum brake before disengaging a drum clutch or shifting a speed clutch to neutral.

n. Do not operate booms that are bent or damaged. Only operate booms that are equipped with preventer guys.

o. Only swing booms or lower loads while looking, warning, and signaling.

p. Only climb on a boom for inspections, change of gear or attempting to make repairs, and then only when the boom is in the horizontal or cradled position.

q. When withdrawing slings from underneath a load, exercise caution to prevent the slings from flying loose and striking personnel or catching and tipping the load.

r. After completing an operation, secure the boom in its stowed position.

s. Ensure when securing from boom operations that the controller and the power switch are both in the "off" position and that power is secured at the main panel.

t. Only lift a known weight from the water. Only handle waterlogged loads when qualified to determine the capability of the boom to handle the load.

u. Additional safety precautions for heavy lifts. (See Naval Ships Technical Manual, Chapter 573 for additional information).

(1) Before making a hoist with a jumbo boom, check all gear thoroughly to make sure that blocks are running free and that none of the lines are chafing. Turns on the drums of winches should lay tight and evenly around the drum. Guy tackles should be free of twists and hauling parts of guys should fairlead to sources of power. Mouse hasps and hooks of snatch blocks securely with seizing wire. Check and tighten stays, shrouds, and preventers.

(2) Before a jumbo boom is operated, swing the ordinary cargo booms at the hatch clear of the working area. Generally, it is sufficient to swing these booms outboard against the shrouds and secure them with the guys. In working deck cargo, however, it may be necessary to top the booms very high in order to clear the deck space.

(3) Do not overload. Make certain that the rig will make the lift safely. Rig carefully and check each piece of gear as it is rigged. Check stays and shrouds. Assign a person to operate the drum brake lever.

(4) Hoist, swing, and lower the load slowly and smoothly. Hoist loads only high enough to clear the coaming, bulwark or any other obstruction.

v. The safe working load (SWL) shall be marked on the heel of each boom. The SWL shall cover the complete range of the manufacturer's (or design) capacity ratings for which they are certified. These letters and figures shall be in contrasting colors to the background and at least one inch in height. A test label plate showing test data, facility conducting test, and date of test should be on the heel of each boom, each padeye, vane guy and winch. Certification test papers shall be maintained by each ship.

w. Where the boom is rated at varying capacities depending on the radius, tables, indicating the maximum safe working loads for the various angles of the boom and the maximum and minimum radii at which the boom may be safely used, shall be conspicuously posted near the controls and visible to the operator when working the gear.

x. During boom operations, personnel immediately involved in the operation (load handlers, safety observer, signalman, winch operators, and winch checkers) shall wear a hard hat with the chin strap in place under the chin.

C0206. <u>CRANES</u>

a. Be familiar with the safe working load of the crane at any given radius. Carefully calculate the weight of the material to be lifted in advance. Accurately determine and compare the radius at which the load will be lifted and set down with the capacity chart of the machine.

b. Dual lifts (two cranes) are extremely dangerous. Attempt dual lifts only when absolutely necessary, and then only under competent supervision throughout the entire operation.

c. Before making a dual lift, carefully determine the proper position of the cranes and the location of the slings to balance the load properly for each crane. Shifting of the load could cause overloading and failure of one crane, thus throwing the entire load onto the second crane and resulting in the failure of one or both cranes.

d. Only operate a crane in a safe manner or when the crane is known to be in a safe condition. Promptly report any malfunctioning or other defects in the equipment to supervisors.

e. Lower the boom under load only with the greatest caution, checking the radius-load capacity chart and the radius indicator where necessary. When lowering loads, limit the speed and do not exceed the hoisting speed for the same load. When making a lift, do not change the position of the boom nor raise or lower the load while it is being swung. Avoid a high boom with no load in a high wind.

f. Never leave loads on cranes. If the load hook is left hitched to an object and it is absolutely necessary that the crane be left, post a guard and tag the crane with a notice such as "**LOAD HITCHED - DO NOT OPERATE**". Place all controls in the "OFF" position, brakes set, and the crane locked in a secure position.

g. Only operate with outriggers in place or properly rigged (mobile crash crane).

h. Operate only with properly adjusted brakes, clutches, and limit stops.

i. Do not operate near an obstruction to the free passage of the boom or the load of the crane.

j. Never lift a load to an unknown greater radius.

k. Use weight indicators only after first checking by common-sense judgment.

l. Do not change capacity charts when using different boom lengths.

m. Do not use weight indicators as weighing devices.

n. Before starting the crane motors, check the operating levers or hand-wheels to make sure they are in a neutral position.

o. At the beginning of each work period, try the upper limit switch of each hoist under no load. Exercise extreme care; inch the block into the limit or run in at slow speed. If the switch does not operate properly, immediately notify supervisory personnel.

p. Never rely on the hoist limit switch to stop the hoist.

q. When starting the drive mechanism and the load or hook approaches near or over personnel, sound the warning signal.

r. Take extra care when handling near maximum capacity loads for a given radius. Inform rigging crew members when this condition exists.

s. Notify the crane operator before ascending or descending from a crane. Do not swing the crane until the person is clear of the crane. Do not ascend or descend, except from the operator's side of the crane. Only the crane operator is allowed on the crane while the crane is being used to move cargo.

t. After completing an operation, secure the crane in its stowed position and disconnect all electric power to the crane controllers.

u. Ensure a minimum clearance of 3 inches overhead and 2 inches laterally between crane and obstructions.

v. Do not place obstructions in passageways or walkways so that the safety of personnel will be jeopardized by movements of the crane.

w. The following procedures shall apply to crane hoist wire ropes:

(1) In using hoisting ropes, follow the crane manufacturer's recommendation. The rated load divided by the number of parts of wire rope shall not exceed 20 percent of the nominal breaking strength of the wire rope.

(2) Allow no less than two wraps of wire rope to remain on the drum when the hook is fully extended.

(3) Anchor the wire rope end by a clamp securely attached to the drum or by a socket arrangement approved by the crane or wire rope manufacturer.

(4) Attach U-bolts to rope clips on the dead or short end of the rope. Spacing and number of all types of clips shall agree with Naval Ships Technical Manual, Chapter 613. Clips shall be drop-forged steel. When a newly installed rope has been in operation for an hour, retighten all nuts on the clip bolts.

(5) Wherever exposed to temperatures at which fiber cores would be damaged, use rope having an independent wire rope or wire-strand core, or other temperature-damage resistant core.

x. If a load is supported by more than one part of wire rope, equalize the tension in the parts.

y. Keep hands free when using crane ladders. Lift and lower articles too large to be carried by hand line.

z. Keep carbon dioxide, dry-chemical, or equivalent hand fire extinguisher in the cab.

aa. Store tools, oil cans, waste, extra fuses, and other necessary articles in a tool box.

ab. Provide sufficient light in the cab to enable the operator to see clearly enough to perform the work.

C0207. HOOKS

a. Know the load capacity of the hook and ensure that such capacity is not exceeded. Test all hooks for which no applicable manufacturer's recommendations are available at twice the intended safe working load before they are initially put into use. Maintain a record of the dates and results of such tests. Inspect hooks periodically to see that they have not been bent by overloading. Do not use bent or sprung hooks. Visually inspect hooks before lifting the rated load.

b. Ensure hooks and rings used with chain have at least as great a strength as the chain. When a hook has been bent by overloading, discard it and use a new hook.

c. Use safety hooks fitted with a safety latch, except on boom and crane hooks configured with a trip line used for boat handling.

d. Keep hands safely away from a hook until clearance is given to hook or unhook. Be especially careful to keep clear of swinging hooks.

e. Set hooks firmly in place before making a lift. Never carry a load on the point of a hook.

f. Unless safety hooks are used, mouse the hook. Do not use box hooks except for raising loads to a height necessary for the placement of slings or dunnage.

g. Do not ride the hoist hook.

h. Rig an insulator link between the hook and the hoist wire for cargo hooks affected by radio frequency voltage.

C0208. CHAINFALLS AND COME-A-LONGS

a. Do not overload chainfalls.

b. Never kink, twist, or knot chains or slings while making a lift, as these are among the greatest causes of failures. Use a chain adjuster or wooden wedges if necessary.

c. Never splice or shorten chains by bolting, wiring, or knotting.

d. Clearly mark chainfalls and come-a-longs to show the capacity. Do not exceed marked capacity.

e. Do not use chain, whether new, repaired, or to which hooks or rings have been added, without thoroughly inspecting. Tag defective chains or slings or immediately cut up and do not allow to lie around the work station.

f. Do not subject chains to sudden shock while in use. Jerky movements put severe strains on the chain.

g. Keep chains free from grit and dirt. Do not drag chains or drop them on hard materials.

h. Use attachments or fittings for chains of the type, grade, and size suitable for service with the size of chain used.

i. Do not exceed the weight for which the equipment was designed.

j. Keep brakes free from grease, oil, and rust. Adjust for wear as required.

k. Do not operate when the ratchet and pawl mechanism is engaged.

l. Keep the equipment dry and rust-free. Lubricate only the load chain.

m. Discard chains which have stretched more than five percent in any five-link section. Note interlink wear not accompanied by stretch in excess of five percent and remove the chain from service when maximum allowable wear at any point of link, as indicated in the following table, has been reached.

n. Unless safety hooks are used, mouse each hook.

MAXIMUM ALLOWABLE WEAR OF ANY POINT OF LINK

Chain size in inches	Maximum allowable wear in fractions of inches
1/4 (9/32)	3/64
3/8	5/64
1/2	7/64
5/8	9/64
7/8	11/64
1	3/16
1 1/8	7/32
1 1/4	1/4
1 3/8	9/32
1 1/2	5/16
1 3/4	11/32

161-521 O - 94 - 2

C0209. NETS

a. Use cargo nets when loading or unloading packages, bundled and bagged materials, or other objects that might roll or shift, creating an unsafe condition if lifted on a sling.

b. When cargo nets are used to discharge cargo on trucks, land the load slowly to prevent damage to the truck and possible injury to personnel. Carefully disconnect the net from the sling and leave the net in the truck with its load.

c. Whenever nets are used to handle unpalletized drums, use steel nets. The drums could cut rope nets and drop on the deck or hatch with possible injury to personnel. When handling barrels in cargo nets, never allow the barrels to rest on their heads. The resulting pressure build-up could cause the heads to bulge and/or pop loose, thus creating an unsafe condition.

d. Inspect nets prior to and during use for wear and damage. Remove worn or damaged nets from service until repaired.

e. Refer to NWP 14E, Replenishment at Sea, Chapter 9, for additional precautions associated with vertical replenishment.

C0210. PALLETS

a. Palletizing speeds up the handling of cargo, prevents damage to easily crushed items, and increases the amount of cargo that can be stacked in a pile. For these reasons, pallets are extensively used in cargo handling operations.

b. When loading a pallet, stack the cargo so that no possibility of spilling the cargo exists, and that the pallet will be stable and level when lifted. When loading a pallet with cases of uneven size, place the highest and strongest cases at each end of the pallet with the smaller and more fragile cases in the center. In this manner, when piling one pallet on top of another, a stronger and more level surface is offered. This will result in safer stowage of the pallets. Lift pallets on which items are loose or broken and which cannot be properly reloaded in cargo nets.

c. Palletize round commodities, such as cylinders, by using specially constructed chocks, made up and spaced to fit the particular cargo. For safe handling, tie the chocks together by two narrow strips which lie in the space between the chocks and are flush with the top of the pallet's platform. Lay the second tier in the cantlines of the first.

d. Use pallet bridles and bars whenever possible and especially when loading or unloading pallets containing even-sized cases or cartons.

e. Use only approved pallet slings for handling palletized ordnance and non-ordnance type cargo.

f. Do not lift a load on damaged pallets. A damaged, palletized load may be lifted if a sound pallet is placed under the damaged pallet or if the load is placed into a cargo net. Otherwise, repalletize the load.

g. Refer to NWP 14E, Replenishment at Sea, Chapter 9, for additional precautions associated with vertical replenishment.

C0211. **SLINGS**

a. When using a sling, distribute the load equally on each leg. Use slings with as small an angle as possible between the legs, as the load on each leg rapidly increases as the angle increases.

b. Protect slings with pieces of rounded wood, heavy bagging, or old rubber (tires) on sharp corners, especially in cases where the sling might slide.

c. Cover protruding ends of eye splices on slings to reduce snag hazards.

d. Do not use slings that are damaged or defective.

e. Never kink slings.

f. Do not load slings in excess of their rated capacities.

g. Balance sling loads used in a basket hitch to prevent slippage.

h. Do not place hands or fingers between the sling and its load while the sling is being tightened around the load.

i. Each day prior to being used, inspect each sling and all fastenings for damage or defects.

j. Permanently affix durable identification stating size, grade, rated capacity, and reach to each sling.

k. Remove slings exhibiting the following conditions from service:

(1) Alloy steel chain slings with cracked or deformed master links, coupling links, hooks, or other components.

(2) Wire rope slings:

(a) With seven randomly distributed broken wires in one strand in one rope lay.

(b) That exhibit wear or scraping of one-third the original diameter of outside individual wires.

(c) That exhibit kinking, crushing, bird caging, or any other damage resulting in distortion of the wire rope structure.

(d) That exhibit cracked, deformed, or corroded end attachments.

(3) Metal mesh slings:

(a) That have a broken weld or broken brazed joint along the sling edge.

(b) That exhibit a reduction of 25 percent in diameter due to abrasion or 15 percent due to corrosion.

(c) That exhibit a lack of flexibility due to distortion of the fabric.

(d) That exhibit distortion of the original cross sectional area of metal at any point around the handle eye.

(e) That exhibit a 15 percent reduction of the original cross sectional area of metal at any point around the handle eye.

(f) That exhibit distortion of either handle out of its plane.

(4) Natural and synthetic fiber rope slings:

(a) That exhibit abnormal wear.

(b) That have powdered fiber between strands.

(c) That have broken or cut fibers.

(d) That exhibit variations in the size or roundness of strands.

(e) That exhibit discoloration or signs of rot.

(f) With distorted hardware.

(5) Synthetic web slings:

(a) Which were subjected to acid or caustic burns.

(b) With melting or charring of any part of the sling surface.

(c) Which exhibit snags, punctures, tears or cuts.

(d) With broken or worn stitches.

(e) With distorted fittings.

l. Do not use nylon web slings where phenolic compounds in any form (i.e., fumes, vapors, sprays, mists, or liquids) are present.

m. Do not use polyester and polypropylene web slings where caustic fumes, vapors, sprays, mists, or liquids are present.

n. Do not use web slings with aluminum fittings where caustic fumes, vapors, sprays, mists, or liquids are present.

C0212. ELEVATORS

a. Cargo/weapons elevators are extremely dangerous if not properly operated or maintained. Only personnel who have received training and are PQS certified on elevator safety precautions and devices may operate or perform maintenance on elevators. (A

b. Obtain the commanding officer's permission before any person can ride a moving "non-man riding" elevator, either on brake, or under power. (A

c. Operate elevators only if appropriately trained. Understand and become familiar with elevator emergency devices and their operation.

d. Ensure that each freight elevator's capacity is clearly marked on a card or plate inside the elevator. Never load an elevator in excess of this rated capacity. Any damaged or inoperable elevator shall be plainly tagged and put out of service until the deficiency is corrected.

e. Do not use freight elevators for passenger use unless the car is authorized and posted for such use. Do not exit or enter any elevator that is in motion. Operators shall not reach into or place any part of the body in the shaftway. They shall be inside the car facing the door at all times while operating the controls.

f. Close and lock shaftway doors before putting an elevator into motion. Keep car grates closed until the car comes to a stop. Keep back from the open edge of any elevator platform not equipped with a grate.

g. Keep hands back from motor-operated doors and only handle manually-operated doors by the handles provided. Never leave the operating mechanism unprotected.

h. If a car fails to start, it may be overloaded. Remove load and retry starting car. Immediately notify person in charge if a car still fails to start even when unloaded. If a car fails to stop, do not attempt to jump free of the car. Safety devices and automatic stops are designed to bring the car to a halt. Notify person in charge of the incident. If a car stops suddenly between decks, call person in charge and further operate the car only at his/her direction.

i. Tag out a car and place out of service before inspecting, repairing, or making adjustments. Close doors during such operation, if possible, and mark **OUT OF SERVICE**. Any doors that must be left open shall be barricaded appropriately and marked.

j. Open the service switch and lock the operating mechanism before cleaning or oiling any part of an electrically-operated elevator. When resuming service, place the operating mechanism in the "stop" position before shutting the service switch.

k. Do not perform maintenance requiring control from the pit or penthouse unless aided by other hands. Assistants shall be posted to report car movements, warn persons away from openings, make adjustments, and otherwise assist as necessary. Do not work under a car unless it is securely blocked; do not move a car while anyone is in the pit or atop the car, except as the person in charge may direct.

l. Investigate at once and determine the cause of any failure or malfunction of an elevator or any of its safety devices, as the fault may be indicative of an unsafe condition of which the operator is not aware.

m. When handling cargo or materials:

(1) Ensure locking device and safe-hoisting attachments are in place before moving a capacity load or heavy, concentrated load on or off the car.

(2) Load safes or other objects near the car's capacity weight at the center of the car and do not allow anyone except the operator to ride with the load.

n. When operating hydraulic airplane elevator platforms:

(1) Lock platform at the flight deck when not in use, especially when aircraft are landing on that area of the deck. The locking mechanism shall be periodically inspected and adjusted to ensure locks engage completely when operating.

(2) Ensure platform is properly secured by locking bars before relieving pressure in the hydraulic arm.

(3) Lower the platform to the hangar deck before draining the elevator. Failure to observe this precaution can result in the platform falling.

C0213. <u>CONVEYORS</u>

a. When using a power conveyor, run the device slowly enough that personnel at the end of the conveyor can handle the packages without rushing.

b. Do not ride a moving conveyor. Signs shall be posted on all conveyors to this effect. Do not walk on idle conveyors, except as required for maintenance.

c. Never leave a powered conveyor unattended while it is in operation. When operating a dual-control conveyor from one control station, use the station affording the best view of the entire conveying operation. For elevated conveyors, this usually means the elevated end. Control stations shall be placarded with operating instructions and precautions.

d. Do not convey materials having an unstable load distribution.

e. Examine all conveyors frequently for sharp edges, dents, worn liners, or any other conditions that could cause injury to personnel or damage to conveyed materials. Inspect power conveyors for loose or broken parts.

f. Examine conveyor belts periodically for tightness and to ensure that the joint in the belt is in good condition and can be relied upon to operate safely.

g. Lubricate rollers, chains, cam plates, and other moving parts frequently and keep in good condition to ensure smooth operation.

h. Do not lubricate, adjust, or repair any part of the conveyor while the machine is in operation. Tag-out and remove from service before performing maintenance, inspection, or adjustments.

i. Wear safety shoes when engaged in loading or unloading of conveyors.

j. To avoid personnel injury from falling cargo, do not go underneath the conveyor or inside the specified safe distance from its sides and ends.

k. Always use the two-man rule when operating conveyors.

l. Always maintain positive communication between the levels of operation.

m. Ensure there is adequate lighting and firm footing (including non-slip) for personnel loading conveyors.

n. Ensure all platform locking bars, interlocks, and audible alarms are working prior to using the conveyor.

o. Ensure that all conveyor operators and maintenance personnel are PQS qualified.

CHAPTER C3

UNDERWAY REPLENISHMENT

C0301. DISCUSSION

a. All precautions listed in Chapter C2, must be followed, during underway replenishment (UNREP) operations. However, several operations involved with UNREP are unique and require special attention and safety. Vertical replenishment (VERTREP) operations are covered in Chapter C7, Helicopter Operations. NWP 14E, Replenishment at Sea, contains additional procedures, requirements, safety precautions, and warnings associated with underway replenishment planning, ship handling, personnel, rigs, and transfer operations.

b. Fueling-at-sea (FAS) and replenishment-at-sea (RAS) involve the transfer of cargo, personnel, and fuel between two or more ships while underway. This involves not only the dangers normally found with cargo transfers but also adds the problem of heavy weather, motion, streaming operations, and the possibility of collisions. For these extra threats, special precautions and practices must exist.

C0302. PRECAUTIONS TO BE OBSERVED PRIOR TO UNREP OPERATIONS

The following precautions should be undertaken by the senior personnel in charge of UNREP Operations:

a. Ensure all UNREP equipment and breakaway equipment are in place and properly operational.

b. Ensure all assigned crew members know their duties, are certified where applicable, and are aware of their responsibilities.

c. Test and ensure that proper communications equipment is being used and is operating normally.

d. Ensure that communications (including back-up systems) are established with the UNREP vessel.

e. Ensure UNREP stations have deck treads or non-skid paint.

f. Ensure all lifelines are in place.

g. Ensure that all UNREP personnel have removed all watches, bracelets, etc., and are wearing life jackets, hardhats, gloves (when handling wire rope or banded material), and safety shoes. Ensure that personnel assigned to work stations are carrying an appropriate knife for routine or emergency use.

h. When fueling, ensure all firefighting stations are properly equipped for any possible cargo fire.

i. Ensure life rings, buoys, and markers are within easy access for UNREP team members, and station lookouts on the fantail for each engaged side.

R) j. Ensure that all UNREP team members are thoroughly familiar with emergency breakaway procedures. Station-to-station phone talkers and station captains should discuss emergency breakaway procedures as soon as sound powered phone communications are established. Phone talkers should never fasten the phone strap around their necks. Emergency breakaway procedures shall be issued by the delivery ship, but can be initiated by either ship.

k. Ensure that all cargo handling equipment, including padeyes, are not overloaded.

l. Post UNREP warnings at designated personnel transit areas.

m. Only allow essential personnel at UNREP stations.

n. Ensure that all UNREP personnel wear snug fitting clothes.

o. In cold climates, make sure all ice and snow is removed from UNREP station and that the UNREP area deck is properly sanded.

p. During night UNREP operations, ensure that all lights are operating.

q. Personnel transfers:

(1) Make sure transferring personnel wear hardhats and inherently buoyant life jackets equipped with whistle, personal lights, and dye marker.

(2) Ensure that transferring personnel know how to get out of the transfer chair in an emergency.

(3) Inspect transfer rig before using. In particular, inspect the manila/synthetic highline for evidence of rot, broken strands, cuts, or other signs of weakened condition.

(4) Use only manila/synthetic highlines and messenger lines. Hand tend messenger lines and highlines.

r. Ensure that a ready lifeboat is available in case of an emergency.

s. Clear area of dunnage.

t. Ensure padding is in place for ordnance.

A) u. Assign a PQS qualified safety observer to every UNREP station during the unrep evolution. Ensure that the safety observer's only function is to watch for hazardous conditions. The safety observer should know the locations of all nearby eye wash stations and be familiar with emergency measures in the event of accidental eye splashing.

v. Ensure a safety brief is held prior to the first UNREP evolution for all participants in the UNREP evolution after a port call or as warranted. (A

C0303. PRECAUTIONS DURING UNREP OPERATIONS

All personnel shall comply with the following:

a. Wear hardhat, gloves (when handling wire rope or banding material), life jacket, and safety shoes.

b. Wear snug fitting clothing that is appropriate for the weather conditions. Remove rings, watches, key rings, and other personal gear which may become entangled in loads or lines.

c. Know the location of lifesaving and firefighting stations.

d. Be aware and exercise caution when line throwing gun and/or bolo are in use.

e. Stand clear of bights.

f. Transit the UNREP station area in the designated transit area on the side opposite the UNREP operations station.

g. Never turn your back on incoming cargo.

h. Stand clear of suspended or incoming cargo.

i. Do not stand between incoming cargo and a fixed object.

j. Secure cargo immediately.

k. Never step into cargo nets.

l. Know all emergency procedures, especially emergency breakaway.

m. Do not smoke.

n. Ensure supervisors are immediately informed of all damage or broken equipment, including the conditions of lines.

o. Ensure ship-to-ship phone talkers do not fasten phone line straps around the neck.

p. Passing lines:

(1) When possible, use a line throwing gun for initial line transfer. Ensure that a bolo line is available at each transfer station as a backup. (R

(2) CV/CVN, LPH, LPD, LHAs, LHDs, and ships configured for multiple air operations shall provide the shot line.

(3) Send the bolo/gun line across only after being advised that the station on the delivery ship is ready.

(4) Do not aim line-throwing guns and bolo lines to areas on the other ship that are under cover or where activities are obscured.

(5) Direct all station personnel to take cover before indicating ready to receive the bolo/gun line.

(6) The bolo/gun line shall be retrieved by specified personnel only upon the order of the officer in charge of the station.

q. Neatly fake or coil down all lines to avoid a tripping hazard.

r. Stay clear of all lines especially bights, unless directly engaged in their handling. Line handlers should always be inboard and forward of all lines, space permitting.

R) s. Space permitting, keep at least 6 feet from any block or cleat through which lines pass.

t. Use tag lines to control a load during hoisting and lowering.

u. Secure cargo to prevent shifting.

v. Ensure that all transfers of empty hooks are treated as full load transfers with the proper catenary maintained.

w. Keep working areas clear of all dunnage and items that create a tripping hazard.

x. When handling ammunition and guided missiles, use padding on decks, bulkheads, and gun mounts in the vicinity of the station.

y. Raise loads only as high as necessary to clear obstructions.

z. Do not overload hoist rigs.

aa. Keep the bridge informed of any change affecting the readiness of the station to transfer. When reporting all lines clear, ensure that all lines are clear of the receiving ship. When reporting all lines on deck, ensure that no lines are trailing in the water but are in fact on board and clear of the ship's sides.

ab. Do not step on or in cargo nets attached to a cargo hook.

CHAPTER C4

SMALL BOATS

C0401. DISCUSSION

a. Several types of small boats are utilized by the Navy. All can be used for emergency evacuation, and several can be used as utility boats to carry personnel and small amounts of cargo.

b. The most dangerous operations involving small boats are the launching and retrieval of these boats. It is during these periods that mechanical failure of boat davits and launching/retrieval machinery can occur, and when weather and sea state can have its worst effects.

c. Unsafe contract liberty boats (water taxis) have contributed to the death and injury of Navy personnel. To reduce the hazards associated with these operations, contracts for these services shall specify a minimum level of safety and seaworthiness. In addition, commanding officers are required to ensure that a knowledgeable officer inspects water taxis prior to their being placed in service and at least daily thereafter. Section C0405 provides guidance on these safety inspections. (A

C0402. PRECAUTIONS FOR LAUNCHING AND RETRIEVAL

The following precautions must be followed:

a. Inspect all equipment before use, especially the condition of the boat falls, the machinery, and the boat itself.

b. Conduct an operations and safety briefing. Ensure personnel riding the boat wear an inherently buoyant life jacket, securely fastened, and a battle helmet with chin strap unbuckled or a safety helmet with the chin strap fastened under the chin. Personnel assigned to the boat handling station will dress out the same except they shall always fasten their chin straps under the chin.

c. Conduct a boat inspection. Inventory equipment; put the bilge plug in the boat; remove ropes from bags; and check hoisting hook, rings, slings, and bales.

d. Keep non-essential personnel away from the davit area. Do not stand under the boat during lowering or raising.

e. Prepare davit to raise/lower the boat. Post a davit winch watch to monitor the spooling of the wire rope falls.

f. Notify the bridge and raise/lower the boat slowly when cleared. Check that the sea painter is connected.

R) g. Only permit those persons actually required to be in the boat during lowering or hoisting operations and they shall hold on to the man-ropes provided. Man-ropes shall be positioned to the outboard side of the boat.

h. Release the stern hook first when launching from a two point lift.

i. Do not launch a boat when own ship's speed is greater than 5 knots. (Does not apply to rigid inflatable boats).

j. Do not hoist boats aboard ship or lower with water in the bilges in excess of that which would normally be removed by the installed bilge pumps.

k. Never engage a crank when hoisting motor is energized.

l. Properly secure lifting hook bails before a boat is raised or lowered.

m. Be alert for any possible malfunctioning and act quickly if it occurs. Do not lower or raise the davit arms into the davit arm stops at full speed. Do not use limit switches as stop switches.

R) n. When hoisting a motor whaleboat with survivors embarked, only three crewmembers are required to be aboard: bowhook, sternhook, and coxswain. It is recommended that other crewmembers be disembarked by alternate means in deference to survivors prior to hoisting the motor whaleboat. Although undesirable, when human life is in jeopardy and depending on operating conditions, the motor whaleboat limit of seven persons may be exceeded. The boat and boat davit safety factors are sufficient to permit hoisting the motor whaleboat to the rail or deck edge when carrying the full capacity (see Naval Ships Technical Manual (NSTM), Chapter 583, Section 5 for detailed guidance). However, under no circumstances shall the boat be swung in or out when carrying more than seven people.

o. Before raising or lowering a boat, ensure all slings, bale shackles, and pins are seated and seized.

C0403. <u>SMALL BOAT FUELING</u>

a. If possible, fuel a boat in the daytime and while it is in the water with its engine stopped. Fueling a boat at night requires the permission of the officer of the deck.

b. If it is necessary to fuel a boat in its shipboard stowage, provide adequate fire fighting equipment at the scene.

c. DO NOT fuel boats with passengers on board.

d. Prior to fueling, make a grounding connection between the fuel delivery pump and the fuel tank for gasoline propelled boats.

e. Always keep gas cap in place when not fueling.

f. Only personnel specifically authorized by the ship's engineer officer shall fuel small boats.

g. Do not permit smoking or use of non-explosion-proof lights in the vicinity of small boats while fueling operations are in progress.

h. Before starting the engine, inspect compartments and bilges, clean, and ventilate as necessary.

C0404. **OPERATIONS**

a. Obey rules of the road strictly. Especially important to boat coxswains is the "Rule of Good Seamanship" which requires that boats give way to ships and seaplanes. Boats should turn away from ships or seaplanes early and radically or show clearly their intentions not to embarrass the larger and less maneuverable vessels.

b. Always post a bow lookout while underway.

c. DO NOT cut close to ships anchored or tied up or pass close around the corner of a pier, except when such a procedure cannot be avoided. Coxswains must run slowly until there is no danger of collision with any boat or vessel which may be obscured.

d. Boat capacity

(1) Never exceed the designated personnel carrying capacity. In carrying stores, the load in pounds, including personnel and stores, shall never exceed the maximum allowable cargo load. Do not carry passengers, stores, or baggage on the top sides of motorboats. If it is necessary to carry stores or baggage, reduce the maximum number of passengers accordingly. Refer to NSTM, Chapter 583, for detailed guidance.

(2) Installation of flotation material shall not relieve operating personnel from exercising prudence in the loading of boats or providing of lifejackets when conditions warrant.

(3) Be familiar with the designated carrying capacity of the boat and be able to calculate the load and regulate the number of personnel accordingly.

(4) In choppy seas, reduce capacity. The rated capacity designated on the label plate is the maximum capacity under the normal weather conditions in calm waters. Always reduce capacity under extreme weather conditions or in the open sea.

e. Always display proper lights while underway at night.

f. DO NOT use gasoline to clean the engine or its parts.

g. Keep bilges and sumps dry.

h. Prohibit smoking or open flames.

i. Only start the engine if excessive fumes or vapors are not present. Check for leaks, damaged piping, and loose connections. Correct deficiencies. If a leak is observed during engine operation, stop the engine and correct the cause of the leak.

j. Use PQS qualified boat officers in foul weather or reduced visibility or for long duration trips, first boat trips in foreign or unfamiliar ports, and when returning large liberty parties after sunset.

k. Do not operate the boat with a defective bilge pump.

l. Never open the bow ramp of a landing craft while underway.

R) m. Ensure boats carry proper fog signalling equipment (refer to NSTM, Chapter 583, section 6) and two 18-inch life rings, one forward and one aft. Life rings shall be secured in such a manner that they are easily broken out for use.

n. For precautions on charging small boat batteries, see paragraph C0903.

o. Ensure boat crewmembers wear lifejackets under adverse weather conditions, including reduced visibility.

p. Run boats dead slow when passing other boats that are alongside ships or landings, in narrow or crowded waters, and when passing deeply laden boats.

q. Ensure that inherently buoyant life jackets are readily accessible in boats for all members of the crew and all passengers. The number of personnel allowed in the boat should never exceed the number of life jackets available.

r. Do not operate boats with enclosed engine rooms without the engineer being on board and at his or her station, and then only when proper ventilation is assured.

s. Ensure that boat fire extinguishers are in place and charged.

t. Ensure that life jackets are always kept dry. If they become wet, they should be dried.

u. Inspect the electrical system for loose connections and worn insulation before operating a boat and whenever damage to these systems is suspected. Do not operate the boat until corrective action is completed.

v. Display lights prescribed by law when underway between sunset and sunrise or in reduced visibility. (Refer to NSTM, Chapter 583, Section 6 for guidance).

w. Carry portable parts of the hull, listed in the NSTM and the boats outfitting list in the hull allowance, at all times when waterborne. (Refer to NSTM, Chapter 583, Section 2 for guidance).

x. Ensure shackles and pins are used for anchors. Ensure hoisting slings or bales and steering cables are seized and/or cotter pins are in place.

y. Boat handling system

(1) Be sure winch and davit safety and operating placards, lubrication charts, and test label plates are posted. Ensure winch controls, brake, clutch, and pawl handles are labeled to show function and direction of movement.

(2) Always check the wire rope on the winch drum before operation to ensure the wire is properly spooled on the drum.

(3) Except in an emergency, always check limit switches for operability.

(4) Ensure all turnbuckles used on boat gripes are marked to show the limit of tensioning.

z. Ensure that only qualified (Class II or above) swimmers are assigned as boat crew members. (R

C0405. <u>CONTRACT LIBERTY BOAT SAFETY</u> (A

a. Prior to being placed into service, a knowledgeable officer, acting for the commanding officer, shall inspect and approve all contract liberty boats (water taxis) for operational safety.

(1) Ensure the navigation lights, lighted compass, distress signals, and a fog signal device are present and in working condition, and that the area charts are available and current.

(2) Ensure that fire extinguishers are present in sufficient number for the size of the boat.

(3) Verify that there is a working radio aboard, with backup battery, capable of bridge-to-bridge communications.

(4) Inspect the anchor and anchor chain for adequacy given the size of the vessel.

(5) Verify that the weather deck drains are free from obstructions and drain overboard; not into the bilge.

(6) Check engineering spaces/compartments for fire or flooding hazards.

(7) Conduct a visual inspection topside for conditions which may be hazardous to passengers.

(a) Ensure that the vessel is equipped with sufficient clean and serviceable life jackets for the maximum capacity of the vessel. Life jackets must be stowed in a readily accessible place marked clearly in English.

(b) Verify that decks, railings, doors and seats are structurally sound, latched, and tightened as appropriate.

(c) Ensure that no bare or exposed electrical wires or connections are located in the passenger area.

(d) Validate that sufficient unobstructed exits are present and marked in English.

(e) Verify that no missile hazards, loose gear, or trip hazards exist.

b. It is impractical to establish detailed specifications for each and every inspection item. Inspectors must use their judgment and experience when advising the commanding officer of the overall safety of the contract water taxi.

c. Any item missing that is critical to safety may be provided by the commanding officer for the duration of the contract boat services. In all cases where government furnished property is provided due to contractor's failure to meet the terms of the contract or the contractor's vessel is unsafe for use, the commanding officer shall immediately notify the contracting officer of the circumstances surrounding the deficiency(ies). If the contracting officer is not on site, notification shall be by message.

d. Boat officers shall be assigned to the contract water taxis during hours of darkness, low visibility, and heavy weather. They shall be PQS qualified by the ship and responsible for maintaining good order and discipline of naval personnel onboard.

e. When boat officers are assigned to contract water taxis, they have the authority to not allow boarding when the water taxi's crew performance and navigation are unsatifactory. When weather conditions are determined to be unsafe, the boat officer has the authority to refuse to sail.

f. Due to shipboard manning complexities and contractual requirements, Commander, Military Sealift Command may need to modify the procedures established above for liberty boat safety.

CHAPTER C5

WIRE AND FIBER ROPE

C0501. DISCUSSION

Ropes come in a multitude of types, quality, and sizes, each with its own characteristics. In general, there are two types of rope: fiber (natural and synthetic) and wire. When removed from a coil or reel, fiber ropes are generally referred to as lines. Wire is referred to as "wire rope" or "wire", but not "cable". Each of these ropes have been developed to satisfy a specific requirement. They can be safely used, but must be properly maintained.

C0502. GENERAL PRECAUTIONS

a. Always inspect wires and lines before use. Look for deterioration, broken wires or fibers, visible signs of rot, chafing, variations in color, crushing, or the other signs of damage.

b. Wear safety shoes with skid-proof soles before handling lines. When handling lines, do not wear rings, watches, key rings, and other items that may become entangled.

c. Check all rollers, capstans, gypsy heads, and windlasses, to ensure they are operating satisfactorily.

d. Avoid getting hands, feet, or clothing caught in bights formed by lines.

e. Do not stand directly in line with the point where (around a bitt, capstan, or through a block) lines change direction.

f. Do not straddle or stand on wires or lines, whether under tension or not.

g. Avoid placing wires or lines on rough or sharp surfaces that can cause chafing or cutting.

h. Do not place objects on wires or lines.

i. Ensure all kinks are out of wires or lines before use.

j. Check sheaves and blocks being used for proper size and strength.

k. Listen to lines under tension. Any unusual popping or tearing noises may mean that the line is in danger of failing.

l. Always place hands above lines fairled into gypsy heads, capstans, or bitts.

m. Do not lubricate lines.

n. Do not apply loads suddenly.

o. Never leave wires or lines under strain on gypsy heads or capstans.

p. Do not use sheaves or drums with corrugated grooves.

q. Do not use sheaves or blocks that are too small for the wire or line used.

r. Remove the loose ends of splices.

s. Seize all bitter ends.

t. Use the same type of material for stoppers as the hawser being held (i.e., synthetic stopper for synthetic line). Chain shall be used for stoppers on wire rope.

u. Do not use manila, wire, spring-lay rope, or synthetic line together on the same chock, bitt, or reel.

v. Carefully make up lines not in use and stow clear of walkways or passages.

w. Do not permit rat guards and sharp edges to wear mooring lines. Use chafing gear and lash well.

x. Change boat falls, highlines, and mooring lines in accordance with Planned Maintenance System (PMS) procedures. Failure to make such changes can result in serious injury.

y. Make up lines not in use and stow clear of walkways and passages.

z. Ensure wires, lines, and rigging are not subject to overload.

aa. Use steadying or frapping lines on boat falls and large lifts to prevent uncontrolled swinging or twisting.

ab. Refer to Naval Ships Technical Manual (NSTM), Chapter 613, Wire and Fiber Ropes and Rigging for additional information on use, maintenance, and material requirements for ropes.

C0503. <u>NATURAL LINES</u>

In addition to the precautions stated in paragraph C0502, these precautions shall also be followed:

a. Do not use natural lines in sheaves and blocks built for wire rope service.

b. Never use manila lines 5 or more years old.

c. Inspect lines for broken fibers, cuts, mildew, and fraying.

d. Do not stow unused lines in sunlight; hot, cold, or wet areas; or other areas where weather damage could occur.

e. Store lines in cool, dry spaces.

f. Fake lines down after use to dry out.

g. Do not use frozen lines until thawed.

h. Do not allow lines to come into contact with chemicals, acid, alkalies, paints, soaps, rust, or vegetable oils.

i. Do not drag lines over sand, grit areas, or non-skid decks.

j. Do not let line wear become localized; rotate lines.

k. Use chafing gear if necessary.

l. Only use undamaged lines. Always remove damaged lines from use and repair or discard immediately.

m. Do not use chain or wire stoppers on fiber lines.

n. Do not continue to use natural fiber line in which any of the following conditions are present:

(1) Ruptured fibers and powdering between the strands.

(2) Dark red, brown, or black spots between the strands, and a sour, musty or acidic odor.

(3) Thirty percent of the yarns in the cross-section have been worn through.

(4) Long jawed and distorted strand areas.

(5) Salt incrustation and swollen areas.

(6) A harsh, dry, dead feel in manila or sisal line.

(7) Evidence of gritty material between the strands.

C0504. SYNTHETIC LINES

In addition to the precautions in paragraph C0502, the following precautions shall be observed:

a. Do not expose lines unnecessarily to heat, sunlight, excessive cold, or chemicals.

b. Always thaw frozen lines before use.

c. Store nylon and polyester lines under cover or tightly wound on reels or on cleats during excessive cold.

d. Install tattletale lines to gauge how much lines are stretching.

e. Payout lines on cleats, bitts, or capstans slowly. Exercise extreme care when easing out synthetic lines under heavy load. Because of their high extendibility under load, their rapid recovery, and their low coefficient of friction, these ropes may slip suddenly on easing out, thereby causing injury to line handlers. For control in easing out or surging, take two round turns on the bitts and then apply one or two figure eight bends. No more than two figure eight bends shall be used. Because these bends tend to lock under surge, use of more than two figure eight bends will cause difficulty in easing out operations.

f. Double-up lines under excessive strain.

g. Never use wire or chain stoppers on fiber lines.

h. Stand clear of lines under strain. (The videotape "Synthetic Line Snapback" should be viewed for an appreciation of this phenomenon.)

C0505. WIRE ROPE

In addition to paragraph C0502, the following precautions shall be observed:

a. Always wear heavy duty gloves when handling wire rope.

b. Always wear goggles while splicing.

c. Seize wire ends to prevent unlaying.

d. Store wire rope away from weather, acid, and chemicals.

e. Inspect wire rope in accordance with PMS procedures.

f. When using U-bolt clamps to form an eye, always put the U-bolt itself over the bitter end. Tighten clamps only after putting line under stress.

g. Only operate winches with more than two turns of wire on the drum.

h. Do not use sheaves or blocks designed for use with fiber rope with wire rope.

i. Inspect end fittings, such as sockets, connectors, and wire rope clips prior to use to determine if there is an area of break adjacent to the fitting. Tighten clips after the first hour of running and at PMS specified intervals thereafter. Remove clips after long use and examine rope for broken wires. Remove the damaged part, if broken wires are found, and make a new attachment.

j. Inspect the bitter end of a wire on a drum to ensure it is properly attached.

CHAPTER C6

GROUND TACKLE AND TOWING

C0601. DISCUSSION

a. Ground tackle is a general term used to refer to the anchor, anchor chain, the anchor windlass, and auxiliary equipment. Although this chapter discusses the gypsy head, additional information is provided under general line handling precautions in Chapter C5.

b. Personnel injury may result if any part of the anchor or its handling system fails when under strain. Precautions must be observed to avoid personnel injury or system damage resulting from excessive strain.

c. Towing is an evolution which is seldom accomplished except in an emergency or for training. Due to the large inertia associated with the ships involved in the evolution, it can be extremely hazardous particularly if excessive strain is placed on the tow line and its parts. No list of precautions for safety in towing can be complete and fully comprehensive; principles of good seamanship must always be followed as the last safety guide. The safety precautions stated within this chapter are basic and shall always be followed.

C0602. GROUND TACKLE PRECAUTIONS

a. All personnel shall wear snug fitting clothing, gloves, hardhats, safety shoes, and safety goggles.

b. Check equipment to ensure it is in proper operating condition.

c. Ensure all equipment is lubricated and fluid levels are adequate.

d. Keep hands or feet off of moving anchor chains.

e. Beware of oily areas or ice on decks during cold weather. Clean up oil and spread salt and/or sand for ice.

f. Do not walk backwards.

g. Ensure proper communications to the bridge and the machinery spaces have been established prior to any evolution.

h. Only enter the chain locker when no anchor operations are planned and only with OOD permission. Chain lockers should be entered only when the ship is in port. Space must be certified as gas free before entry (see Chapter B8).

i. Check that the chain locker is clear and free for running before using the anchor.

j. Allow only the anchor/line detail in the ground tackle area during operations.

k. Set brake on windlass immediately when yellow painted chain link is visible.

l. Never allow the chain to run free without braking. Excessive payout speed can cause loss of the anchor, or injury to personnel.

m. Ensure anchor chain is securely fastened to the padeye in the chain locker when reinstalling the chain after painting.

n. If using chain stoppers, set and clear the immediate area before strain is put on the chain.

o. Always keep the hawser deck bolster pipe cover in place when not hoisting or letting go the anchor.

p. When first red chain link appears on deck and the brake fails to hold, clear the immediate area.

q. House anchor in hawse pipe shell bolster at the lowest possible speed.

r. Operate windlass at a low speed whenever chain out exceeds 60 fathoms.

s. If the chain tends around the stem, report the situation to the bridge. The chain must be allowed to run free or the sharp bend may damage links. Detachable links are particularly susceptible.

t. Replace anchor chain if corrosion has reduced the mean diameter to less than the criteria in the Naval Ships Technical Manual, Chapter 581, Anchors and Anchoring.

u. **Windlasses**

(1) When at anchor, nothing shall interfere with the readiness to run, slip, or heave in the chain, or let go the spare anchor.

(2) When using the gypsy head, observe the following safety precautions:

(a) Never make a line fast to the gypsy head, but only to fittings provided for that purpose, such as cleats or bitts.

(b) Disengage the wildcat shaft locking head and hold the wildcat by the brake.

(3) When using the capstan, observe the following procedures and safety precautions:

(a) Keep capstan heads free of gouges, paint, and rust.

(b) When using the capstan for heaving, ensure turns are taken in the right direction for heaving.

(c) Never make lines fast to capstans, but only to fittings provided for that purpose, such as cleats or bitts.

(d) When handling lines on the capstan; when possible, the line handlers should be positioned perpendicular to the line of pull.

(4) Ensure operating, safety, and lubrication label placards and test label plates are posted on or in the vicinity of windlasses or capstans.

(5) Ensure controls, brakes, and clutch levers are labeled properly.

(6) Never place any part of the body into moving machinery. (A

(7) Do not wear jewelry, neckties, or loose fitting clothing while operating equipment. (A

(8) Wear proper protective clothing and equipment suited to the operation being performed (i.e., hearing protection, eye, hand and foot protection, dust and organic vapor respirators). (A

v. <u>Anchors and Chains</u> (For additional information on Anchors and Anchoring see Naval Ships Technical Manual, Chapter 581).

(1) When heaving in, two observers, detailed by the officer in charge, shall examine each link of the chain, as it comes in, for cracks and other defects. Special attention shall be given to the detachable links to ensure they have not come loose.

(2) Periodically inspect and overhaul anchors and chains. Observe the following precautions when inspecting the chain:

(a) Engage the wildcat while paying out the chain.

(b) If working on a barge or the pier, do not stand between the side of the ship and the anchor chain during paying out and restowing operations.

(c) On the barge or pier, secure each shot of chain with rope stops if the possibility exists of the chain taking charge and running uncontrollably over the side. This is likely to occur when the barge has no sides and/or the barge or the pier are not directly under the hawse pipe.

(3) Only assemble detachable links with matched parts. Fit detachable links in the outboard swivel shot with a hairpin lock wire.

(4) All hands should be advised that the only safe stowage position for an anchor that has been removed from the ship is with the crown, fluke tips, and shank all lying on the deck. Personnel should not be assigned to conduct work on or in the vicinity of an unstable anchor.

w. **Stoppers**

(1) When utilizing more than one chain stopper to hold a chain, divide the strain as equally as possible among the different stoppers. If the turnbuckles are kept well greased, the strain on each stopper will be indicated by the "feel" of the wrench used in tightening them up.

(2) When using chain stoppers to ride to, first set the windlass brake- band hard, then attach the chain stoppers and tighten their turnbuckles. Lastly, disconnect the wildcat from the windlass drive shaft.

(3) Never straddle chain stoppers.

(4) Use stoppers with locking plates when being towed.

(5) Ensure all shackle pins are seized.

x. Ensure that windlass test label plate, safety and operating placards, lubrication chart, and a ground tackle safety placard are posted near each anchor windlass.

C0603. TOWING PRECAUTIONS

a. When synthetic rope is used in towing operations without a towing engine, use a towing hawser with a scope of at least 100 fathoms from the ship being towed and 100 fathoms from the towing ship. Avoid springing the hawser so much that it straightens clear of the water. Never allow the towing hawser to drag on the bottom.

b. Take steps to reduce chafing and wear on the towline. Provide proper chafing gear and, when a towing engine is being used, freshen the nip every day if chafing chains are not used.

c. Inspect towing hawsers thoroughly during overhaul periods.

d. Before disconnecting the anchor chain on the forecastle for towing, take the following precautions:

(1) Use a wire rope preventer of adequate size to support the weight of the anchor to back up the housing stopper and prevent accidental dropping of the anchor.

(2) Use a chain stopper, if available; otherwise, insert a steel bar through a link across the upper lip of the chain pipe deck bolster or lash with rope.

e. Make provisions for letting go the towline in an emergency (axe, large bolt cutters, cutting torch, release stopper, pelican hook).

f. Build up turns slowly when getting underway.

g. Keep the tow abaft the beam.

h. Verify that the towline, bridle, and allied towing gear is in good condition. Never use a hawser that is kinked or frayed. Always rig properly and perform maintenance in accordance with PMS schedule and procedures.

i. If the tow is sinking, disconnect the towline immediately. Failure to do so may result in injury or in damage to or possible loss of the towing ship.

j. Unless sinking of tow is imminent, do not abandon it. The towing ship is responsible for preventing the tow's loss.

k. Ensure that a sufficient catenary exists in the towing hawser to absorb shock loading. Never tow at short stay in rough weather.

l. Keep a sharp lookout for small weather fronts. A sudden, unexpected weather change can cause great damage.

m. Towing speed is a function of hull configuration, towing ship power, weather conditions, and design of the rig. Tow at a speed below which damage to the towing rig or tow will occur. Be conscious of stresses in determining towing speed.

n. Keep unnecessary personnel from the vicinity of the towline.

o. Ensure personnel engaged in rigging/unrigging evolutions wear safety helmets, safety shoes, inherently buoyant life jackets, and gloves.

p. Fit chain stoppers used for towing with a locking plate and pin to ensure the turnbuckle is locked and cannot work itself off the threads.

q. See Reference C6-1 for additional precautions on towing.

r. Ensure that a towing safety placard is posted in the vicinity of tow and be-towed stations.

CHAPTER C6

REFERENCES

C6-1 U.S. Navy Towing Manual (SL 740-AA-MAN-010).

CHAPTER C7

HELICOPTER OPERATIONS

C0701. DISCUSSION

a. Helicopters are used for varied operations at sea, including anti-submarine warfare (ASW), vertical replenishment (VERTREP) and search and rescue (SAR). Helicopters create special hazards, and catastrophic accidents can severely damage a ship and cause injury and/or death.

b. Helicopter accidents can happen at any time and can involve anything from a crash on takeoff/landing to in-flight emergencies that require an immediate landing. Additionally, accidents can involve injury to ship's personnel from numerous areas, such as, static electricity discharge during hoisting evolutions, inadvertent external cargo release during VERTREP operations or injury from debris blown about by rotor wash.

c. These standards are written for all ships which are air-capable.

d. Consult NWP 42J (Shipboard Helicopter Operating Procedures) and NWP 19-1B (Navy Search and Rescue Manual), Chapter 4, for further details concerning specific procedures and related safety procedures.

C0702. PRECAUTIONS

a. Avoid approaching within 50 feet of a helicopter when the rotor blades are turning, unless necessary. Whenever required to approach or leave a helicopter which has its blades rotating, remain in full view of the pilot and keep in a crouched position. Unless authorized, do not work in the area of the cockpit or cabin rearward while blades are rotating. Do not attempt to leave or approach a helicopter when engaging or disengaging rotors.

b. Always wear complete flight deck uniforms, safety goggles, etc. Long sleeve shirts must be worn with sleeves rolled down at all times during flight operations. Personnel involved in flight deck operations including maintenance and refueling will wear approved, non-sparking, safety shoes or boots with non-slip oil and fuel resistant soles.

c. Never run after clothing or equipment that may have been blown away by rotor wash. Ascertain the situation and walk to where your equipment is lodged.

d. Do not walk backwards.

e. Remove soft hats topside during helicopter landing/take-off.

f. Listen to, and watch, the helicopter for signs of malfunction.

g. Know the location of firefighting and lifesaving equipment.

h. If helicopter appears to be in imminent danger of crashing or its blades are coming too close to fixed objects, take cover.

i. Prohibit garbage dumping during helo operations.

j. Prohibit blowing tubes when helicopter is on or in close proximity to the flight deck.

k. Do not stand under helicopter. If duties, e.g., VERTREP hookupman, hovering helicopter in flight refueling (HIFR), hoist operations require it, exercise extreme caution.

l. Ground the helicopter, utilizing the discharge wand or grounding line as it is hovering before conducting HIFR, cargo or passenger hoisting operations. Ensure that personnel use approved electrical gloves prior to handling the discharge wand or grounding line.

m. Never secure any helicopter hook or line, except the SH-60 RAST or grounding wire, to the ship.

n. Make sure a rescue boat is ready for immediate use in case of emergency.

o. Have red (ship not ready to receive helo) and green (ship ready to receive helo) signalling devices ready for use.

p. Ensure medical, fire, and rescue parties are in position during flight operations.

q. Ensure that crash and rescue equipment are on hand for emergency use.

r. FOD is the acronym for "Foreign Object Damage". It is used to define any article or object which may be disturbed by the wind across the deck or rotor wash and may cause damage to personnel, aircraft, or equipment. A FOD walkdown shall be conducted on the weather decks and flight deck prior to flight operations. FOD prevention is an all hands effort.

s. Establish positive communications between helicopter and helicopter control officer (HCO) or combat information center (CIC), as appropriate.

t. Secure all hatches that open into the helicopter operating area. Scuttles and hatches that open into the aircraft operating area will be posted with the following notice: **CAUTION: DO NOT OPEN DURING FLIGHT QUARTERS EXCEPT FOR EMERGENCY EXIT. NOISE HAZARD AREA - HEARING PROTECTION REQUIRED.**

u. While flight operations are being conducted, only authorized personnel shall be permitted on the flight deck or weather areas adjacent to the flight

deck. Personnel shall not stand in or otherwise block entrances to flight deck weather areas.

v. Never turn your back to launching or landing helicopters.

w. Only the landing signal enlisted/landing signal officer shall use red or green wands during night operations.

x. Do not take flash pictures during flight operations.

y. NATOPS, U.S. Navy Aircraft Firefighting and Rescue Manual (NAVAIR 00-80R-14) prescribes minimum firefighting and rescue operating instructions and procedures applicable to shipboard fire protection, prevention, and suppression. The U.S. Navy Aircraft Emergency Rescue Information Manual (NAVAIR 00-8R-14-1) provides information and procedures for rescue of flight crews in the event of flight deck crashes or fire.

z. Exercise extreme caution and be on the alert for dangerous situations when working with or around helicopters.

aa. Ensure helicopters parked on the flight deck and in the hangar are properly secured with chocks and tie down chains in accordance with NAVAIR 17-1-537 for anticipated wind and sea conditions.

ab. All personnel involved in flight deck operations are to remove potential FOD items, i.e., keys, pens and dog tags from pockets, jackets, etc. Pockets must be buttoned.

ac. Cranial helmets are required to be worn and securely fastened when working from a workstand or when atop the helicopter.

ad. Be familiar with procedures for fighting fires involving aircraft with live ammunition, missiles and rockets. Know whether a helicopter is carrying live ammunition, where it is, and the types present before beginning to fight a fire.

ae. Night operations are always the most critical for both pilots and flight deck crews. The tempo of operations must be reduced in both volume and intensity when compared to day operations. Slow and careful handling of the aircraft by all concerned is mandatory. Night operations are in effect from thirty minutes prior to sunset to thirty minutes after sunrise.

C0703. REFUELING PRECAUTIONS

a. Handle aviation fuel only in properly covered containers.

b. Dispose of waste or rags soaked in aviation fuel as soon as possible. Use approved, correctly labeled, metal receptacles with self closing covers for the disposal of oily rags, waste and other combustibles.

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c. Do not introduce any light, except an explosion proof light, into a compartment or space where aviation fuel or flammable fumes are present.

d. Discharge aviation fuel overboard only with the commanding officer's permission.

e. Aviation fuel spilled on deck shall be immediately swabbed and the incident reported to the HCO and the Assistant HCO.

f. Prohibit lighted cigarettes or exposed flames of any kind in the vicinity of tanks, pipes or containers carrying aviation fuel.

g. Avoid breathing aviation fuel vapors.

h. Wash with soap and water as soon as possible if skin or clothing has come in contact with aviation fuel.

i. Wear goggles to prevent eye injury when handling aviation fuel.

j. The smoking lamp shall be out on the flight deck, hangar, and adjacent weather deck when conducting flight operations due to continuous presence of aviation fuel. The smoking lamp shall be out in the hangar at all times.

k. Use the NATOPS Aircraft Firefighting and Rescue Manual for information on fire protection.

l. Only those members of the flight crew and ship's refueling crew considered necessary for the conduct of helicopter fueling operations shall be in the vicinity of the helicopter.

m. A ground wire shall be attached to the deck and then to the helicopter, and a wire from the nozzle then to the helicopter, before the fueling nozzle is attached.

CHAPTER C8

WORKING OVER THE SIDE OR ALOFT; DRY DOCK SAFETY

C0801. DISCUSSION

a. Since many areas on the exterior of a ship are inaccessible to the crew from decks or built-in work platforms, it becomes necessary to go "over the side" or "aloft" to reach these areas. "Over the side" shall be defined as anywhere outboard of the lifeline system. "Aloft" shall be defined as any mast, kingpost, or other structure where the potential for a fall exists.

b. The greatest hazard associated with working over the side or aloft is the danger of a fall. Other hazards include the dropping of objects on (or by) personnel, radiation burns, and asphyxiation.

c. When a ship is in dry dock, many of the precautions associated with working over the side or aloft must be followed. This chapter will discuss the hazards and precautions associated with this unique evolution.

d. Personnel suspended over the side by a crane are subject to radiation burn hazards from voltage induced in the hoist wire. When personnel are suspended over the side by a crane, all precautions listed in this chapter shall be taken.

C0802. GENERAL PRECAUTIONS

a. An appropriate check sheet shall be routed to the OOD/CDO for permission for working over the side or aloft. Example check sheets can be found in Appendices C8-A and C8-B.

b. Wear a parachute type safety harness with Dyna-Brake® safety lanyard, working lanyard and tending line (as required) with double locking snap hooks. The harness shall be inspected in accordance with established PMS prior to use.

c. When performing hot work, replace personal safety and staging/boatswain (bosun) chair fiber lines with wire rope. Personal safety lines shall be corrosion resistant steel (CRES) wire rope.

d. Attach safety lanyards to all tools, if practicable. Never carry tools up and down ladders. Rig a line and raise/lower tools in a bucket.

e. Stop work when the ship begins to roll in excess of 10°, or the ship begins to pitch in excess of 6°, or windspeed is greater than 30 knots, and/or an icestorm/lightning threatens.

f. Ensure appropriate signal flags are hoisted. (KILO for personnel working aloft; KILO ONE for personnel working over the side; KILO THREE for personnel working aloft and over the side.)

R) g. When underway or when working near stacks or exhausts which are actively discharging gases, the commanding officer's permission is required to work aloft or over the side.

h. An experienced senior person shall check the rigging of the bosun chair or staging prior to use. Never rig lines over sharp edges. Inspect lines for damage, rot, and wear.

i. The petty officer in charge shall mark off an area and keep unnecessary personnel clear. He/she shall also maintain a sharp lookout for anything that would cause an increase in ship's motion. If the slightest chance of collision exists, personnel shall be moved to safety.

j. Read any safety placards posted in the area prior to commencing work.

k. Cranes used to suspend personnel over the side shall be certified and work platforms shall be approved by COMNAVSEASYSCOM as safe for manned handling.

C0803. <u>ADDITIONAL PRECAUTIONS FOR WORKING OVER THE SIDE</u>

a. Wear an inherently buoyant lifejacket modified with a button hole in the back for concurrent use with the parachute type safety harness and wear a hardhat with chin strap.

b. Each person working over the side shall have an assistant to tend lines.

c. Secure ship's propellers and overboard discharges in the area of personnel working over the side.

d. Only perform work between ships or between a ship and dock with a camel in place.

e. Perform work over the side with the ship in dry dock only with the commanding officer's permission.

f. Do not use electric power wire brushes and chipping tools over the side.

g. Personnel shall keep clear of all shore power cables, steam, and high pressure lines.

h. Do not work over the side until a checklist similar to Appendix C8-B is completed.

C0804. PERSONNEL WORKING ALOFT

a. Do not go aloft on masts, macks, stacks, or kingposts or be suspended over the side by a crane without first obtaining written permission from the OOD in the form of a working aloft checklist as described in paragraph C0802.

b. Wear supplied air respirators when working near stacks or exhaust which are actively discharging gases. (R

c. Use a climber sleeve assembly in conjunction with the safety harness when going aloft where a climber safety rail is installed.

d. Prior to commencement of work and every 15 minutes thereafter, pass a verbal warning over the 1 MC, "**DO NOT ROTATE ANTENNAES, ENERGIZE OR RADIATE ANY ELECTRICAL OR ELECTRONIC EQUIPMENT WHILE PERSONNEL ARE WORKING ALOFT.**" If personnel aloft are in the vicinity of the stacks add, "**DO NOT BLOW TUBES OR LIFT SAFETY VALVES WHILE PERSONNEL ARE WORKING ALOFT.**" (R

e. Inform ships in the vicinity that personnel will be working aloft to ensure they take appropriate action on operation of electrical or electronic equipment.

f. Departments concerned shall ensure that all radio transmitters and radars that pose radiation hazards are placed in the STANDBY position and a sign placed on the equipment that reads: "SECURED. PERSONNEL ALOFT. DATE_____ TIME_____ INITIALS_____."

g. Position a safety observer on deck near the work being performed. Outfit the safety observer with a safety harness, lanyards, and climber safety sleeve to permit rapid emergency assistance aloft if required. The safety observer shall keep the deck area beneath the work aloft free of unnecessary personnel.

C0805. DRY DOCK SAFETY PRECAUTIONS

a. Personnel working over the side shall comply with the precautions indicated in this chapter with the exception that life jackets are not required in dry docks without water. Personnel working over the side in drydock will normally be in a man basket with safety harness and Dyna-Brake® worn. (R

b. Ensure all staging is adequately constructed and supported.

c. Only enter the dock with a hard hat, safety shoes, and eye protection. (R

d. Shift no weights within the ship while in dry dock without the permission of the docking officer.

e. Ensure the ship is adequately grounded at all times.

f. Drain all lines subject to freezing, in freezing weather.

g. Ensure adequate topside lighting is provided by either installed dock lights or by temporary lighting, particularly in areas where normal passage is obstructed or disrupted by service lines or work in progress.

h. Ensure that any equipment which projects through the hull is only operated with the permission of the commanding officer and then with a safety observer outside the hull.

i. Do not permit sleeping topside, horseplay, leaning on lifelines, or other negligent practices leading to falling over the side.

R) j. Do not throw anything over the side into the dock, including debris from cleaning or preservation.

k. When aboard a ship carrying fuel of any kind in drydock, do not allow fuel to drain into the dock. Should it be necessary to remove fuel from tanks or receptacles while in drydock, take precautions which will prevent any of the fuel from reaching the floor of the dock.

R) l. Safety nets shall be rigged extending a minimum of 6 feet on both sides under all access brows between the ship and the dock apron.

Appendix C8-A

WORKING ALOFT CHECK SHEET

USS _____ Time/Date _____

1. Personnel will be going aloft at (location) _____ for accomplishing the following work _____
_____

2. Prior to allowing personnel to go aloft, accomplish the following:

Initials

_____ a. If underway or when working near stacks or exhausts which are actively discharging gases, obtain the commanding officer's permission. (R

_____ b. DANGER tag-out all rotating equipment, such as radar antennas, in the vicinity of the work area.

_____ c. Place a sign on all HF, MF, and LF transmitters and all radars whose danger zone encompasses the work area. The sign should read: SECURED. PERSONNEL ALOFT
DATE_____ TIME_____ INITIALS_____

_____ d. Ensure personnel going aloft are wearing a parachute type safety harness with a Dyna-Brake® safety lanyard, working lanyard, and climber safety device (if a climber safety rail is installed). Ensure that PMS has been accomplished on all equipment prior to use.

_____ e. Notify the engineering officer of the watch/engineering duty officer to ensure that safety valves are lifted only in an emergency when personnel are aloft (main control should notify the officer of the deck of an impending emergency as soon as possible to permit warning of personnel aloft).

_____ f. If work is to be accomplished on or in the vicinity of the whistle, secure power to the whistle (steam, air, electricity) and **DANGER** tag-out.

_____ g. Ensure that personnel are briefed on safety prior to going aloft. This should include, as a minimum, keeping the lanyard attached with a minimum of slack to a fixed structure at all times; changing the lanyard connection point as work progresses; keeping good footing and grasp at all times.

_____ h. Ensure all tools are attached to personnel with preventer lines; or, if passed up, have lanyards attached which are firmly secured before removal from the bucket.

_____ i. Ensure that assistance is provided to keep areas below the working area clear and for passing tools or performing rigging.

_____ j. Ensure that personnel working in the vicinity of stacks, or other areas where they may be subjected to exhaust fumes, are wearing proper respiratory protection equipment.

_____ k. Do not permit work aloft, except in an emergency, if wind speed is greater than 30 knots, roll is in excess of 10°, pitch is in excess of 6°, or if ice or thunder storms threaten.

_____ l. If in port, notify officers of the deck/command duty officers of adjacent ship(s) to ensure that high-powered radio and radar transmitters will not be energized and endanger personnel going aloft.

_____ m. Fly the KILO or KILO THREE flag, as appropriate, if in port.

R) _____ n. Prior to personnel going aloft, have the following passed over the 1MC: **"DO NOT ROTATE ANTENNAES, ENERGIZE OR RADIATE ANY ELECTRICAL OR ELECTRONIC EQUIPMENT WHILE PERSONNEL ARE WORKING ALOFT."** If personnel aloft are in the vicinity of the stacks add, **"DO NOT BLOW TUBES OR LIFT SAFETY VALVES WHILE PERSONNEL ARE WORKING ALOFT."**

_____ o. If a crane is used to suspend personnel, ensure that the crane has a current certification and the work platform is approved by COMNAVSEASYSCOM for handling personnel.

_____ p. Be sure the safety observer is properly outfitted and positioned.

3. Conditions have been established to permit personnel working aloft.

_____
Command Duty Officer/Officer of the Deck/Time

Working Aloft Commenced _____

Working Aloft Completed _____

Note: **Initials certify completion of an item. If an item is not applicable, indicate "NA" on initial line.**

Appendix C8-B

WORKING OVER THE SIDE CHECK SHEET

USS _____ Time/Date _____

1. Personnel (number) _____ will be going over the side at (location) _____ _____ for accomplishing the following work _____
_____

2. Prior to allowing personnel to work over the side, accomplish the following:

Initials

_____ a. If underway or in dry dock, or working near exhausts which are actively discharging gases, obtain the commanding officer's permission. (R

_____ b. Ensure that personnel working over the side wear a parachute type safety harness with Dyna-Brake® safety lanyard and working lanyard, wear an inherently buoyant lifejacket modified with a button hole in the back to wear with the safety harness, and wear a hard-hat with a chin strap. Appropriate PMS shall be performed on harness, safety lanyard, and lifejacket prior to use. (Note: If working from a float or punt in the water, safety harness and safety lanyard are not required. Lifejackets and hard hat shall be worn. If in a dry deck without water, the life jacket is not required).

_____ c. Each person working over the side has an assistant to tend lines. (Note: If working from a punt or float, at least one assistant shall be provided on the deck or pier. If in a dry dock without water, a tending line is not required.)

_____ d. Ship's propellers are stopped and overboard discharges in the area of personnel working over the side are secured and DANGER tagged.

_____ e. If work is to be accomplished in port between the ship and a pier or between the ship and other ships, a camel is in place.

_____ f. Power tools, if in use, are pneumatic. NO electric powered tools shall be used.

_____ g. Ensure that an experienced, senior person has checked the rigging of the bosun chair or staging prior to use.

_____ h. Ensure that personnel working over the side are briefed on safety prior to working over the side.

_____ i. Do not permit working over the side, except in an emergency, if wind speed is greater than 30 knots, roll is in excess of 10°, pitch is in excess of 6°, or if ice or thunder storms threaten.

_____ j. Ensure that a petty officer in charge of work is stationed. Ensure PO in charge is alert for anything which would cause an increase in ship's motion or for the possibility of a collision.

_____ k. If in port, notify officers of the deck/command duty officers of ships alongside.

_____ l. Fly the KILO ONE or KILO THREE flag, as appropriate, if in port.

_____ m. If a crane is used to suspend personnel over the side, ensure that the crane has current certification and that the work platform is approved by COMNAVSEASYSCOM for handling personnel.

3. Conditions have been established to permit personnel working over the side.

_____
Command Duty Officer/Officer of the Deck/Time

Working Over the Side Commenced _____

Working Over the Side Completed _____

Note: Initials certify completion of an item. If an item is not applicable, indicate "NA" on initial line.

CHAPTER C9

ELECTRICAL AND ELECTRONIC SAFETY AND TAG-OUT PRECAUTIONS

C0901. DISCUSSION

a. Practically every piece of equipment on board ship requires electrical power. Radars, communication equipment, gun mounts, as well as lighting, portable tools, and personal equipment, all use power from the ship.

b. The fact that electrical equipment and tools are so commonplace means that hazards involved with electricity are often taken for granted. This is despite the fact that the hazard of electrical shock is commonplace ashore where the extra shipboard hazards of high powered equipment, unstable work spaces, and saltwater are usually non-existent. Compared to other environments, the potential for electrical shock aboard ship is increased. Although ships' electrical/ electronic systems are ungrounded, personnel and equipment may easily become a path to ground in cases of faulty wiring, resulting in injury or death or damage to equipment.

C0902. DEFINITIONS

a. "Electrical equipment" shall include generators, electrically powered machinery and mechanisms, power cables, controllers, transformers, and associated equipment.

b. "Electronic equipment" shall include radars, sonars, radios, power amplifiers, antennas, electronic warfare equipment, computers, and associated controls and peripherals.

C0903. ELECTRICAL PRECAUTIONS

a. Do not touch a conductor, until it is tested, to be sure it is de-energized.

b. Obey all warning signs; read equipment warning labels before use.

c. Never work on live (energized) electrical equipment without the commanding officer's permission and only per Naval Ships Technical Manual (NSTM), Chapter 300.

d. Always de-energize and "tag-out" with red "DANGER, DO NOT OPERATE" (R
tags, installed electrical equipment before starting any maintenance or repair. Test for energized circuits per NSTM 300.

e. Do not energize any equipment that is tagged-out. Properly clear the tag first.

f. Only use authorized equipment.

g. Close all fuse boxes, junction boxes, switch boxes, and wiring accessories.

h. Ground all metal-cased electrical equipment, except double insulated.

i. Never operate a switch with the other hand on a metal surface.

j. Do not use equipment with worn or damaged cords, or crushed or damaged plugs. They are not to be patched with electrical tape.

k. Never use outlets that appear to be burnt.

l. When using a metal cased tool, ensure it is equipped with a three-conductor cord and three-pronged plug.

R) m. Wear certified and approved electrical gloves when using metal-cased portable electric equipment, or when using electric handheld portable tools in hazardous conditions, wet decks, and bilge areas. Leather gloves shall be worn over electrical gloves when the work being done could damage the electrical gloves.

R) n. Check that portable electric equipment and extension cords have been inspected and have a current inspection label affixed.

o. Only use electric equipment in explosive atmospheres if the equipment is approved for such use (explosion proof).

p. Ensure that "dead-man" switches work properly when installed.

R) q. Do not allow cords to run through hatches, chemicals, scuttles, or water-tight doors or over sharp objects or hot surfaces.

r. Do not join more than two 25-foot extension cords together.

s. Use a voltage indicator to test whether equipment or circuits are energized.

t. Never remove overload relays except for replacement.

R) u. Use insulated rubber mats, boots, electrical gloves and all safety precautions in NSTM, Chapter 300 when required to work on energized circuits or equipment.

R) v. Use skin and eye protection when working with wet cell batteries and changing battle lantern batteries.

w. When using portable electric devices connected to extension cords, plug the device into the extension cord before the extension cord is inserted into a live bulkhead receptacle. Likewise, unplug the extension cord from the bulkhead receptacle before the device is unplugged from the extension cord.

x. Do not allow cords to kink, nor be left where they might be damaged by vehicle/foot traffic. When it is necessary to run electrical leads through doors or hatches, protect the cord to guard against accidental closing of the door or hatch.

y. Return portable electrical power tools, drop cords, extension cords, and security lighting after use to the Portable Electrical Tool Issue Room as required by Chapter B7 of this manual.

z. Elevate cords extending through walkways so they do not become a tripping hazard or interfere with safe passage.

aa. Visually inspect portable cables for any signs of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles. Cables shall be of the proper length and cross-sectional area. Do not use spliced portable cables.

ab. Use only COMNAVSEASYSCOM-authorized extension lights for shipboard use in order to eliminate or drastically reduce the many hazards associated with the use of unauthorized commercial grade lights. The approved lights most frequently used aboard ships are:

(1) A 100-watt incandescent bulb equipped with 50-foot, three conductor cable for use as a general multipurpose extension light, NSN 9G6230-00-701-2947.

(2) A small 4-watt fluorescent tube for servicing electronic equipment. This light is of all plastic construction with no outside conductive surfaces. It is intended for use in open electronic equipment only. It is not explosion proof and is not acceptable for use in hazardous atmospheres.

ac. Only install fuses of the rating specified on a fuse box or panel. Do not over fuse. Identify fuse panels that are missing fuse-rating labels. In addition:

(1) Do not use equipment that exceeds circuit design, operating, or starting amperage (for example: high speed buffers).

(2) Ensure that each phase of a multi-phase circuit is correctly fused.

(3) Ensure that an adequate supply of the correct fuses is aboard ship, particularly 15 amp fuses.

ad. Do not connect single-phase 115v mobile equipment, permanently located and energized more that 50 percent of the time (copiers, personal computers and their peripherals, vending machines, and money machines) to the ship's isolated receptacle circuits. Connecting these equipments to the ship's isolated receptacle circuits may overload the circuits, resulting in fire hazards. Connect each equipment of this type to a separate single phase circuit through an isolation transformer supplies by the lighting distribution

system. See NSTM, Chapter 300 for temporary modifications to power such mobile equipment.

A) ae. Do not use aluminum or metal portable ladders when working on electrical equipment.

C0904. **BATTERIES**

a. The charging of batteries will produce hydrogen gas which may be ignited causing fire and explosion. Verify that battery compartments, which have been sealed, are first opened and well ventilated before entering, turning on any lights, making or breaking any electrical connections, or doing any work in the compartment. Verify that the ventilating apparatus of a battery compartment is running properly before starting to charge batteries. Keep the battery storage area or compartment well-ventilated during charging.

b. While battery charging is in progress, post a warning placard at the access to the battery storage area or compartment that reads: **CAUTION: BATTERY CHARGING IN PROGRESS.**

c. Prohibit smoking in the charging area.

d. Prevent open flames, sparks, or electric arcs in battery charging areas.

e. Keep uninsulated tools and other metallic objects away from the top of uncovered batteries. When using tools around a battery, do not allow tools to bridge the battery terminals or short circuit any part of the battery. Only tools with insulated handles shall be used on the battery.

f. During normal use, keep cell service openings closed except when they must be opened to take readings or add water. When charging batteries, completely unscrew the battery cap, but leave the cap in place on top of the service opening. This will allow hydrogen gas, which is formed during the charging process, to escape but will minimize the release of sulfuric acid mist into the shop atmosphere.

g. Keep cell tops clean.

h. Never stow loose gear in the battery compartment. Gear such as cleaning rags, hydrometer boxes, pieces of wire, and tools must be removed immediately after use.

i. Charge a battery only at the rate stated on its name plate. Never charge a battery at a higher finishing rate than that stated on its name plate.

j. When charging several batteries at once, ensure the voltage of the charging line exceeds the total voltage of all the batteries being charged,

but that the charging rate in amperes does not exceed the maximum charging rate of the battery in the line having the lowest ampere-hour capacity.

k. Do not operate batteries above 52°C (125°F). When charging batteries, lower the charging rate immediately if battery reaches 52°C (125°F) or emits gas.

l. When charging batteries, keep compartment temperature below 36°C (96°F), if at all possible.

m. While current is flowing in the charging line, do not attempt to repair the connections of any battery or connect/disconnect batteries from the line. Turn current off before attempting any of these procedures.

n. Do not add acid of specific gravity greater than 1.350 to a battery.

o. Water added to a battery must be pure distilled water. Never add salt water to a battery or use salt water to wash out battery components. Salt water added to a battery will evolve extremely toxic chlorine gas.

p. Do not pour water into concentrated sulfuric acid. The heat generated will cause a violent reaction. Sulfuric acid is highly corrosive. Wash up spillage with water and sodium bicarbonate. When handling acid or electrolyte, always wear a rubber apron, rubber boots, rubber gloves, chemical goggles, and a face shield.

q. When connecting or disconnecting batteries in compartments that may contain gasoline fumes, make every effort to avoid producing sparks. In any use of batteries, verify that all connections are tight to prevent loose connections causing sparks.

r. When batteries are used with one terminal grounded, always disconnect (R
the grounded terminal first when replacing battery.

s. Lithium batteries shall not be used aboard ship without specific approval of COMNAVSEASYSCOM.

t. Primary batteries, especially mercury and lithium batteries, shall never be punctured, incinerated or recharged.

u. Dispose of mercury and lithium batteries promptly as used hazardous (R
material. Mercury cell batteries shall be disposed of at the first available shore installation. Lithium batteries shall not be stored at sea for shore disposal, but shall be disposed of in water over 600 feet deep per Chapter B3 of this manual. Ashore, dispose of lithium batteries per Chapter B3 of this manual.

v. Turn the battery switch off when battery-driven equipment is not in use or battery charge becomes insufficient to operate equipment. Remove batteries from any equipment that is to be stored or shipped. Cover removed

batteries' terminals with insulating material to prevent short circuits. In the case of equipment powered by dry batteries, remove batteries if equipment is to remain idle for 2 weeks or more. These batteries should be scrapped or stored.

w. Store batteries in an adequately ventilated and cool fireproof area.

x. Use appropriate eye and skin protection when moving or charging wet batteries or working with acid.

y. Ensure that battery charging circuit ventilation fans are interlocked so that if power is lost to the fans, the battery charger turns off.

z. Ensure alkaline batteries and equipment are segregated from lead acid batteries and equipment.

aa. The B section of the Navy Type 19026 battery can deliver an extremely serious or fatal shock. Avoid contacting the terminals of this high voltage battery.

C0905. ELECTRICAL FIRES

D)
A) a. For electrical fire fighting procedures, see NSTM, Chapter 555.

b. Battery Fires:

(1) A battery fire is nearly always preceded by an explosion. Great care is required fighting such a fire to avoid creating another explosion.

(2) The safest and most effective method for fighting a battery compartment fire is through oxygen starvation. Secure the compartment and stop all ventilation within, including agitation air, to deprive flames of oxygen.

WARNING

NEVER attempt to extinguish a battery fire by pouring water on the battery. The hydrogen and oxygen generated by electrolysis could produce a violent explosion.

c. Electrical Fire Prevention:

(1) Keep electric motors and generators clean.

(2) Ensure proper maintenance is performed on electrical equipment, i.e., motors, generators, bearings, and filters.

(3) Report overheating or arcing electrical equipment.

(4) Keep air filters clean.

C0906. FIRST AID FOR ELECTRICAL SHOCK

a. Fundamentally, electrical current rather than voltage is the criterion of shock intensity. The passage of even a very small current through a vital part of the human body can cause death. The voltage necessary to produce the fatal current is dependent upon the resistance of the body, contact conditions, the path through the body, etc.

b. It is imperative to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from 115 volts or even lower voltage; fatalities from as low as 30 volts have been recorded. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms and possibly as low as 100 ohms from temple to temple if the skin is broken. Volt for volt, DC potentials are normally not as dangerous as AC as evidenced from the fact that reasonably safe "let-go currents" for 60 hertz alternating current is 9.0 milliamperes for men and 6.0 milliamperes for women while the corresponding values for direct current are 62.0 milliamperes for men and 41.0 milliamperes for women.

(1) Symptoms of Electrical Shock. In the event of severe electrical shock, the victim could become very pale or "bluish." His/her pulse is extremely weak or entirely absent, unconsciousness is complete, and burns are usually present. The victim's body may become rigid or stiff in a few minutes. This condition can be caused by muscular reaction to shock, and it shall not, necessarily, be considered as rigor mortis. Therefore, artificial respiration shall be administered immediately, regardless of body stiffness, as recovery from such a state has been reported. Consequently, the appearance of rigor mortis shall not be accepted as a positive sign of death.

(2) Rescue of Victims. The rescue of electrical shock victims is dependent upon prompt administration of first aid. All electrically trained personnel shall be trained annually in cardiopulmonary resuscitation (CPR) procedures by an instructor certified by an authorized agency, such as the American Red Cross or the American Heart Association.

CAUTION

Do not attempt to administer first aid or come in physical contact with an electrical shock victim before the power is shut off, or, if the power cannot be shut off immediately, before the victim has been removed from the live conductor.

(3) When attempting to administer first aid to an electrical shock victim, proceed as follows:

(a) Shut off the power.

(b) If the power cannot be deactivated, per step (a), remove the victim immediately, observing the following precautions.

1. Protect yourself with dry insulating material.

2. Use a dry board, belt, dry clothing, or other available non-conductive material to free the victim (by pulling, pushing, or rolling) from the power-carrying object. DO NOT TOUCH the victim.

(c) Immediately after removal of the victim from the power-carrying object, administer artificial respiration.

(d) When providing first aid measures, any possible spinal injuries or fractures should be taken into consideration.

R) **C0907. ELECTRONIC PRECAUTIONS**

a. Definitions:

(1) Repair - Removal or replacement, by any method, of any component, subassembly, module, circuit card, or conductor to bring malfunctioning equipment back to an operational status.

(2) Corrective maintenance - Alignment, adjustment, tuning, or trouble shooting of malfunctioning equipment per published maintenance or technical manual procedure.

(3) Preventative maintenance - Alignment, adjustment, tuning, or testing of operational equipment to ensure performance within published maintenance card or technical manual procedures.

b. Repair of electronic equipment is normally accomplished with the circuit deenergized. Every effort should be made to avoid making repairs to energized equipment. DO NOT repair energized electronic equipment unless you are using approved procedures from technical manuals or other documentation, or an emergency condition exists and the commanding officer has granted permission to perform such repair. In such an emergency, trained personnel shall accomplish the repair of energized circuits and an experienced technician or officer shall supervise. Electronic repair personnel should observe the safety precautions in section 3-4 of the Electronics installation and Maintenance Book (EIMB), NAVSEA SE 000-00-EIM-100, General Handbook.

c. Corrective maintenance on energized electronic equipment is authorized when done according to published maintenance or technical manual procedures. Freelance corrective maintenance (i.e.,without a published procedure) on energized electronic equipment shall be performed ONLY with the specific permission of the commanding officer.

d. Preventive maintenance on energized electronic equipment is authorized when it is according to a published maintenance requirement card or technical manual procedures.

e. Only perform preventive or corrective maintenance on energized electronic equipment when duly authorized and trained on that type of equipment.

f. Whenever work on energized electronic equipment exposes the technician to 30 volts or greater the following precautions shall be adhered to:

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Research into or enter energized electronic equipment enclosure for the purpose of servicing or adjusting only when prescribed by applicable technical manuals, maintenance requirement card, or other approved documentation.

(3) Obtain the commanding officer's permission whenever work on energized electronic equipment deviated from published corrective or preventive maintenance procedures.

(4) Station a safety observer capable of securing power and rendering adequate aid in the event of an emergency.

(5) Provide warning signs and suitable guards to prevent personnel from coming in accidental contact with dangerous voltage.

(6) Obey all warning signs and heed all equipment warning labels.

(7) Insulate the work from ground with approved electrical grade rubber matting. Installation requirements for electrical grade matting are contained in Chapter 634 or NSTM.

(8) Remove or snugly secure any loose clothing. Remove all jewelry.

(9) Insulate all metal tools.

(10) Use only one hand, if practical, in accomplishing the work.

(11) Wear electrical grade rubber gloves on both hands, if possible. If the nature of the work is too cumbersome to wear gloves on both hands, then a glove shall be worn on the non-working hand.

g. Reaching into deenergized equipment also required special care and precaution.

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Ensure you are familiar with all circuits that must be deenergized and all voltage storing and high voltage components.

(3) Discharge all voltage storing components with an approved shorting probe.

(4) Do not touch a conductor or electronic component unless you have proven it to be deenergized by using a known good voltage tester.

h. Removal of a unit or part from the normal location within an assembly and the energizing of the unit or part, while it is outside the normal enclosure, removes the protective features such as interlocks, grounded, and enclosures. These safety features may then no longer function as designed. Ground the chassis and frame of all units removed for servicing and ground all circuits normally grounded in operation whenever power is applied to the unit.

i. Do not energize any equipment that is tagged out. Properly clear the tag out first.

j. Never defeat an interlock or built-in safety device. Modify such safeguard circuits only as authorized by the cognizant system command.

k. Refer to Chapter 300 of NSTM and Chapter 3 of EIMB General Handbook for additional precautions regarding electric systems.

C0908. TAG-OUT PRECAUTIONS

a. Tag-out procedures shall be enforced at all times. It is necessary during normal operations as well as during repair, testing, or maintenance.

b. Tags will be used to indicate the presence of and requirements for relief valve gagging devices, blank flanges, or similar type safety devices.

c. Tags or labels used in the tag-out program shall not be used for valve identification, for marking deficiencies, or for any other purpose not specified in the tag-out procedures.

d. The absence of a tag or label shall not be construed as permission for unauthorized operation of equipment.

e. Whenever a tag or label is issued, appropriate action to remedy the situation should be initiated.

f. Any person having knowledge of a situation requiring tags or labels should request that they be issued and applied.

g. Enough tags should be used to completely isolate the equipment, component, or system being worked on and to prevent operation of the equipment, component, or system from all stations which could exercise control.

h. Careful planning of tag-outs should be accomplished in an effort to eliminate unnecessary record sheets and tags and to reduce the efforts required to perform audits, particularly during periods of repair.

i. Only qualified ship's force personnel shall position equipment and affix tags and labels aboard ship. Only qualified ship's force personnel shall perform the second check of such tags or labels. Only qualified ship's force personnel shall remove tags.

j. Tags shall be attached such that they are apparent to anyone who may attempt to operate the equipment. Do not attach tags to devices, such as breaker covers, which may be removed.

k. When a tag is used on an electrical isolating device that is capable of being locked out, the tag must be attached at the same location that the lock would have been attached.

l. When a tag is used on a push-button-operated electrical isolating device, the tag must cover the push-button if it is accessible, or be on the panel cover behind which the push-button is located if the button is not accessible.

m. Repositioning of equipment which has been tagged is never authorized until all tags have been cleared. However, when the authorized position of a DANGER-tagged valve is in doubt, the valve position may be checked using the procedures of paragraph 630.17g(1)(b)2 of OPNAVINST 3120.32C.

n. Appropriate supervisory watchstanders shall review the applicable Tag-out Logs during watch relief.

CHAPTER C10

SHIPBOARD FUELS

C1001. DISCUSSION

a. Fuels are used to power the ship, emergency auxiliary equipment, aircraft, vehicles, small boats, and a multitude of smaller pieces of machinery. There are several types of fuels in use, each with its own characteristics and traits. It is impossible to cover all the scenarios that can occur with shipboard fuels; however, this chapter will cover the main points.

b. The biggest hazard with shipboard fuels is explosion and fire. Other hazards include asphyxiation, body burns, eye and respiratory difficulties, and environmental hazards. Due to the incredible impact a shipboard explosion and fire would have, the possibility that a catastrophe could occur should constantly be in the minds of all personnel, especially those involved in fuel storage and transfer operations.

C1002. PRECAUTIONS

a. Never smoke in fuel storage or transfer areas.

b. Prohibit any open flames, hot work, or the use of non-explosion-proof (R
fixtures or equipment near fuel storage or transfer areas. Fluorescent fixtures are permitted in areas in which JP-5 or F-76 are handled.

c. Ensure forced ventilation is in operation during fuel transfers.

d. When working in MOGAS tanks, do not wear, and do not allow others to wear, shoes with steel clips, metal key chains, metal belt buckles, buttons made out of spark producing material, or clothes made of static generating material such as wool, silk, nylon, or Nomex®.

e. Always ventilate fuel tanks and obtain gas-free engineer's certification before entering.

f. Never enter a tank to aid an unconscious crew member without proper respiratory protection and a back-up person standing by. Use of an emergency escape breathing device (EEBD) is not permitted for entering a tank or void.

g. Detect leaks and make immediate repairs in all fuel systems. Clean up pools of leaked or spilled fuel immediately.

h. Inspect tanks, piping, cargo hoses, pumps, and communication equipment before transferring fuel. Ensure a drip pan is under all transfer hose connections and that gaskets are in place in hose joints and couplings.

i. Store oily wastes and rags in an approved container.

j. Do not discharge fuel or oily wastes over the side.

k. Ensure that flash screens (flame arresters) on tank vents are in place and in good material condition.

l. Check air relief valves or pressure-vacuum relief valves to ensure that they are operating properly in accordance with the Planned Maintenance System (PMS).

m. Do not pump fuel until all involved have signaled readiness. Maintain a hose and overboard discharge watch during transfer operations.

n. Frequently monitor fuel levels in tanks. Constantly monitor fuel level when transferring fuel.

o. Avoid physical contact with fuel(s).

p. Do not inhale fuel vapors. Use respiratory protection if vapors are present.

q. Always ground hoses before transferring fuel. Do not break that ground until hoses are disconnected. Hoses that do not have a grounding cable, such as small boat fueling hoses, are grounded by ensuring that the nozzle stays in contact with the fill pipe probe/receiver, Robb coupling, or NATO spools. Effectively ground UNREP hoses.

r. When in canisters or drums, flammable fuels shall be placed on the weather deck if no flammable storeroom is provided. Gasoline storage shall be in remotely jettisonable racks on the weather decks. Do not store near heat sources or near ventilation ducts.

s. Close hatches, doors, and ports in vicinity of tank vents while transferring fuel.

t. While pierside, stop all transfer operations during electrical storms or thunderstorms.

u. Install flange shields over pipe joints in accordance with Naval Ships Technical Manual, Chapter 505. The purpose is to prevent flammable liquids from spraying over a greater area or contacting hot surfaces in the event a leak occurs.

v. During refueling, close and secure all portholes on the engaged side of the ship.

CHAPTER C11

WELDING, CUTTING, AND BRAZING

C1101. DISCUSSION

a. The convenience of metal arc and gas welding and cutting lies largely in the fact that the equipment can be taken to the job. This convenience leads to the performance of construction or repair jobs in locations that have not been designed for such concentrated heat, or mixtures of toxic or explosive gases. The failure to take proper precautions, during welding or cutting operations in such spaces, presents a serious fire, explosion, electric shock, and health hazard.

b. Health hazards common to welding, cutting, and brazing are numerous. In addition to electric shock, burns to the eyes and skin can be caused by sparks, molten metal, and ultraviolet and infrared radiation. Fumes and gases generated by welding can produce ozone and oxides of nitrogen which are poisonous. Lead, zinc, chrome, and cadmium in alloys produce toxic fumes. Paints and coatings may produce toxic gases and fumes when heated by the flames of the welding torch. Additionally, any metal fume is capable of producing metal fume fever. Local exhaust ventilation is a must to remove excessive concentrations of air contaminants. Welding in closed, unventilated spaces can result in respiratory irritation or poisoning of personnel.

c. Hot work includes: (R

(1) Flame heating, welding, torch cutting, brazing, or carbon arc gouging

(2) Any operation which produces temperatures of 400°F (204°C) or higher

NOTE:

Operations not producing **hot** sparks or flame such as spark-producing or arc producing tools or equipment, static discharge, friction, open flames or embers, impact, and non-explosion-proof equipment such as lights, fixtures, or motors are not considered hot work unless occurring in the presence of flammable liquids or in a flammable atmosphere.

d. Where only class alpha materials (ordinary combustibles) (e.g., wood, cloth, paper, rubber, and many plastics) are exposed, hot work is divided into two classes. These are: (A

(1) **Class I**. These processes produce either high energy sparks or slag that can be thrown or dropped at the work site or produce heat that can be transferred through the deck, overhead, bulkhead, or structure to a location not visible to the hot work operator. This class includes:

(a) Flame cutting

(b) Welding

(c) Plasma cutting

(d) Arcing and gouging

(e) Electric arc welding

(f) Thermal spraying

(g) Other hot spark or flame producing process not included in class II.

(2) **Class II**. These processes produce flames or minimal energy sparks or slag which are generally localized to the immediate work area. This class includes:

(a) Stud welding with an electric stud gun

(b) Gas-tungsten-arc (GTA) welding

(c) Torch brazing

(d) Ferrous metal grinding with abrasive disks.

C1102. PRECAUTIONS

a. **Clothing**

(1) Use goggles, faceshield, respirators, flameproof gloves, jackets, leggings and boots, as appropriate.

(2) Remove lighters from pockets during hot work.

(3) Do not wear synthetic-fiber clothing.

(4) Do not roll up sleeves, cuffs, or have open pockets.

(5) Always wear a welder's jacket or sleeves and apron while welding. Helmets and face shields shall be fitted with the proper filter and cover lenses.

(6) Always wear gloves when removing or replacing electrodes, or handling energized holders, tables, or equipment. The gloves shall be dry and in good condition.

(7) Cartridge respirators, when properly selected (see Chapter B6), will protect against the metal fumes generated during welding. They do not provide oxygen, which may be necessary when working in a confined space. They

also do not protect against hazardous gases which may be generated during welding, if sufficient ventilation is not available, particularly MIG and TIG welding. Where either condition exists, use a supplied air respirator.

b. **Space Precautions**

(1) The following precautions shall be observed during the performance of hot work: (R

(a) Do not perform hot work when flammable liquids or flammable atmospheres are present without specific instructions of the Gas Free Engineer.

(b) Inspect the other side of the bulkhead, deck, overhead, or other structure to ensure that hot work will not damage materials or equipment that may be on the other side of the hot work operation.

(c) Remove explosive materials and flammable liquids or vapors and take suitable precautions against the reaccumulation of such materials. For welding in magazines or adjacent to magazines, refer to NAVSEA OP-4, *Ammunition Afloat*.

(d) Where practicable, relocate all combustibles at least 35 feet from the work site. Where relocation is impracticable, protect combustibles with metal guards or curtains constructed of MIL-C-24576 material. Tighten edges of covers at the deck to prevent sparks from going underneath the covers. This precaution is also important at overlaps where several covers are used to protect a large pile of combustibles.

(e) Protect intricate and vulnerable machinery and equipment from falling sparks or other potential sources of fire with metal guards or curtains constructed of MIL-C-24576 material. Secure the protection in-place before commencing hot work.

(f) For hot work processes that generate slag, weld splatter, or sparks, cover openings in decks, bulkheads, or overheads within 35 feet which can be a path to prevent ignition sources from passing into adjacent compartments, spaces, or decks below. A complete containment system as described in Chapter 074, Section 10 of the Naval Ships Technical Manual (NSTM) meets this requirement. If openings cannot be covered, post a fire watch on the far side.

(g) Blank off ducts and conveyor systems that might carry sparks to distant combustibles or otherwise suitably protect.

(h) When hot work is done near decks, bulkheads, partitions, or overheads of combustible construction, take precautions to prevent ignition.

(i) Do not undertake hot work on pipes or other metal in contact with insulation or combustible decks, bulkheads, partitions, or overheads if the work is close enough to cause ignition by heat conduction.

(j) Do not start hot work in areas other than those specifically designated for hot work, such as welding shops, without approval of the commanding officer or his/her designated representative. Abrasive disk grinding with a small wheel (typically 3-inch diameter or less) does not require notification or approval.

(2) Ensure that a gas-free engineer's survey has been completed before working in tanks, voids, or other confined spaces, including adjacent spaces (especially if those tanks contained flammable liquids or vapors) if these spaces are identified as a confined space per Chapter B8 of this manual.

R) (3) Notify the damage control assistant (DCA) or fire marshall before starting hot work. Conduct hot work in or on fuel tanks, in spaces in which fuel tank vents terminate, or in other confined spaces known to contain flammable fuel, only with the commanding officer's approval.

(4) Perform welding and cutting operations in areas laid-out and designated for this purpose, if practicable.

D)
R) (5) Set fire watches as follows:

(a) In **confined or enclosed spaces, machinery rooms, catapult rooms, bilges, and other locations proximate to flammable atmospheres** (e.g., near fuel tank vents and sounding tubes), fire watches shall be posted at the worksite when hot work is undertaken. After completion of the hot work operation, fire watches shall remain on station for a minimum of 30 minutes, ensure that the area is cool to the touch, and ensure that no smoldering embers remain.

(b) For **class I hot work**, post fire watches when hot work is undertaken. The fire watches shall stand watch for fire for 30 minutes after hot work is completed.

(c) For **class II hot work**, the DCA or fire marshall shall determine the need for a fire watch in addition to the hot worker based on his or her assessment of the worksite prior to undertaking hot work. When posted, the fire watch(es) shall stand watch for 30 minutes after hot work is completed.

NOTE:

Abrasive disk grinding on a ferrous material with a large wheel (larger than 3 inches in diameter) typically throws large sparks long distances. A fire watch is recommended for large wheel grinding when class alpha materials (ordinary combustibles) are exposed. The DCA or fire marshall shall determine the need for a fire watch.

(d) When a fire watch is not required for class II hot work, the hot worker shall have the appropriate fire extinguishing equipment available. The hot worker may leave the site after hot work is completed and after he/she has conducted a thorough survey of the area to check for smoldering fires. When

grinding a ferrous material with a large abrasive disk wheel (larger than 3 inches in diameter), the hot worker shall stand watch for 30 minutes after the hot work ends.

(e) When any type of hot work is being performed on bulkheads, decks, or overheads where sparks or heat transfer may ignite combustibles on the opposite, accessible side, set a fire watch on the far side.

(f) The hot worker and the hot worker's supervisor are responsible for ensuring fire watches are in place prior to starting work.

(g) Train fire watches per NSTM, chapter 074, section 10.

(h) Equip fire watches with personal protective equipment (PPE) as required for the operation being conducted (e.g., appropriate eye protection (goggles, glasses, face shield), helmet, respiratory protection, fire retardant clothing).

(i) When more than one fire watch is required, establish a communication means between fire watches.

(6) Ensure fire extinguishing equipment is available in immediate area. (R
The types of fire extinguishing equipment to be used by fire watches is specified in NSTM chapter 074, section 10.

(7) Always use a shield painted with a non-reflecting coat of zinc oxide or flat black in welding booths to separate welders from other personnel.

(8) Contact the DCA/gas free engineer/fire marshal (or industrial hygienist, if available) to ensure adequate ventilation is provided in the space prior to commencing hot work.

(9) Protect personnel in areas adjacent to welding areas from arc-produced ultraviolet radiation burns by using protective screens, goggles, or other approved means.

(10) When welding in a space which is entirely screened on all sides, arrange the screens so that they will clear the deck so as not to restrict ventilation carrying off the fumes and smoke from the operation.

(11) Never weld near a source of halocarbons, such as trichloroethane or refrigerant. Phosgene gas can be produced when halocarbons are exposed to high temperatures.

(12) Do not perform hot work during fueling or ammunition transfer operations. AR, AS, and AD type ships are exempted from this requirement, but shall comply with the requirements of OPNAVINST 8023.21C while performing hot work or ammunition handling.

c. **Practices**

(1) Only use non-shatterable type cylinders.

(2) Never use oxygen to operate pneumatic tools, on oil preheating burners, start internal combustion engines, blow out pipe lines, blow dust from clothing or work areas, create pressure, or for ventilation purposes.

(3) Do not carry oxygen, acetylene, or other fuel gas cylinders into confined spaces.

(4) Always return cylinders to the storage racks when work is completed and ensure cylinders are secured in place by metal retaining collars.

(5) Ground all electrical welding equipment before use.

(6) Stand on a dry surface or insulating material if surface is not completely dry to avoid potential electric shock.

(7) Do not work alone. Post designated personnel nearby for fire watch as well as rescue purposes. Immediate first aid care in case of an electrical shock may prevent serious consequences.

(8) Never permit the metal part of the electrode or the electrode holder to touch the bare skin or any damp clothing which the operator may be wearing. Do not loop the welding cable over your shoulder or other parts of your body. Operators have been dragged off staging or scaffolds when the cables were fouled by other workmen or moving equipment.

(9) Do not put an energized electrode holder under the arm at any time. If an insulated surface or insulated holding peg is not available, remove the electrode and lay the insulated holder on the deck or other adjacent object.

(10) When stopping work for a significant time (lunch or overnight), remove electrode from electrode holder, deenergize the equipment and disconnect welding supply cable from the welding machine.

(11) Where conditions are crowded and welding must be performed close to other personnel, the welding operators shall take special care to ensure that the electrode and holder do not touch nearby occupants.

(12) When using portable machines, ensure that the primary supply cables are separately laid and do not become entangled with welding supply cables.

(13) Inspect work and electrode lead cables regularly for wear and damage. Replace cables with damaged insulation or exposed conductors. Use connecting devices specifically intended for the purpose when joining lengths of supply and electrode cables. Adequately insulate the connecting devices for the proposed service conditions.

(14) Keep welding cables dry and free from grease and oil, wherever practical, to prevent premature breakdown of the insulation which could cause serious short circuits.

R) (15) Suitably support cables overhead when necessary to run them some distance from the welding machine. If this cannot be done, and cables are laid

on deck, protect them in such a manner that they will not be damaged or interfere with safe passage of personnel. Take special care to see that welding supply cables are not close to power supply cables, lighting circuits, or any equipment that utilizes magnetic tapes or depends upon a magnetic principle for operation. Block hatches and doors to prevent damage to welding cables.

(16) Protect welding equipment used in the open from weather conditions (e.g., rain, sleet, snow, spray, etc.) to prevent short circuiting.

(17) Do not smoke cigarettes or use other forms of tobacco while welding or brazing.

d. **Cylinder Safety**

(1) Store individual cylinders securely fastened in the upright position (valve end up) by metal collars, each cylinder independently fastened, and ensure that the cylinder valve protection caps are in place.

(2) Store flammable and explosive gases securely on the weather decks protected from direct exposure to the sun or in flammable compressed gas cylinder storerooms.

(3) Never store flammable gases with oxidizing gases. Typical oxidizing gases are oxygen and chlorine. Compressed gases such as helium, carbon dioxide, nitrogen, and argon can be stored with all gases except acetylene, oxidizing or flammable. Ensure inert gases are segregated and readily identifiable.

(4) Do not lift cylinders by valve-protection caps. Bars shall not be used under valves or valve-protection caps to pry cylinders loose when frozen in place or otherwise fixed. Use warm (not boiling) water to defrost.

(5) Close valves of empty cylinders.

(6) Place cylinders a safe distance away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. Use fire-resistant shields.

(7) Do not place cylinders where they might become part of an electric circuit. Contacts with energized equipment shall be avoided. Cylinders shall be kept away from radiators, piping systems, or layout tables that may be used for grounding electric circuits, such as for arc welding machines. Any practice, such as the tapping of an electrode against a cylinder to strike an arc, is prohibited.

(8) Never use cylinders as rollers or supports, whether full or empty.

(9) Do not change or alter the numbers and markings stamped into cylinders.

(10) Never attempt to mix gases in a cylinder. Unauthorized personnel should never refill a cylinder.

(11) Unless connected to a manifold, do not use oxygen from a cylinder without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve shall be opened slightly for an instant and then be closed. Always stand to one side of the outlet when opening the cylinder valve.

(12) Do not use hammers or wrenches to open cylinder valves. If valves cannot be opened by hand, the cylinder should be returned to supply.

(13) Do not tamper with, or attempt to repair, cylinder valves. If trouble is experienced, remove from service, tag as defective and notify the supplier, indicating the character of the trouble and the cylinder's serial number. Follow supplier's instructions as to its disposition.

(14) Do not remove the stem from a diaphragm-type cylinder valve.

(15) Always place the fuel-gas cylinders with valve end up. Liquified gases shall be stored and shipped with the valve end up. Prior to use, acetylene cylinders must be stored in a vertical position for a minimum of two hours to stabilize the gas.

(16) Handle cylinders carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve, or safety devices and cause leakage.

(17) Close the cylinder valve and release the gas from the regulator before the regulator is removed from a cylinder valve.

(18) Do not place anything on top of an acetylene cylinder which may damage the safety device or interfere with the quick closing of the valve.

(19) Never use fuel gas from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a regulator attached to the cylinder valve or manifold.

(20) Do not use copper tubing with acetylene gas cylinders due to the potential of an explosive chemical reaction taking place.

C1103. <u>EXTRA PRECAUTIONS FOR WORK IN RESTRICTED ACCESS SPACES</u>

a. For the purpose of this section, a restricted space shall mean:

(1) A space with only one exit.

(2) A space where equipment or structural barriers prevent easy exit or entrance.

b. Ensure proper ventilation is available to permit work in restricted access spaces. When sufficient ventilation cannot be obtained without blocking the means of access, personnel in the confined space shall be protected by air line respirators. Ensure space has been certified gas free, if the space is unmanned and ventilation is non-existent or the space is used to store hazardous material.

c. Leave gas cylinders and heavy welding or cutting equipment outside the restricted access space. Secure heavy portable equipment mounted on wheels to prevent accidental movement before operations are started.

d. Station an attendant outside with instructions to observe the welding operator at all times, and in case of emergency, immediately shut off the gas or welding machine and render such help as the occasion warrants.

e. If entering a restricted access space through a manhole or other small opening, means shall be provided for quick personnel removal in case of an emergency. When safety belts and lifelines are used for this purpose, they shall be so attached to the body that the body cannot be jammed in a small exit opening.

f. If the access fitting to a restricted access space is remotely controlled, ensure measures are taken to secure and DANGER tag-out remote control equipment to avoid accidental closing of doors.

g. If work in a restricted access space is suspended for any substantial period of time, electrodes shall be removed from the holders of arc welding equipment. One of the three following precautions must be taken:

(1) Remove all arc welding equipment from the restricted access spaces.

(2) Disconnect all such equipment from the source of power. This shall always be done if the equipment is to be left overnight.

(3) Positively insulate all such equipment, including the electrode holder, so that no accidental contacts can be made even if the equipment is moved during this period.

h. In the case of gas welding equipment, always close the torch valves and the gas supply to the torch, when not actually in use, to eliminate the possibility of gas escaping through leaks or improperly closed valves. The gas supply to the torch must be able to be positively secured from outside the space. The foregoing does not apply to shop spaces in which active stowage of welding equipment has been authorized. Torches shall remain in restricted access spaces only for the period necessary to perform the required hot work. Overnight and at the change of shifts, the torch and hose shall be immediately removed from confined spaces when they are disconnected from the torch or other gas consuming device.

CHAPTER C12

SHIPBOARD AIRCRAFT SAFETY

C1201. DISCUSSION

a. This chapter applies to ships that have full flight and hangar decks (R
(CVs, CVNs, LHAs, LHDs, and LPHs). This chapter also applies to helicopter operations on such ships.

b. Flight decks are hazardous and the danger to personnel goes beyond the possibility of crashes. Air intakes on jet engines can actually "suck" personnel off the deck and into the engine. Jet engine exhaust can propel personnel into other objects or over the side of the ship. Propellers and rotor blades can maim or kill. Aircraft carry ordnance and fuel that can cause fires and explosions. Moving aircraft can hit personnel. The ship itself is pitching and rolling. For these reasons, personnel whose job requires them to work on the flight deck must be constantly alert and aware of all dangers in order to avoid injury or death.

C1202. GENERAL FIRE PRECAUTIONS

a. **Smoking**

(1) Smoking or open flames shall not be permitted on flight/hangar decks, sponsons, and weather decks.

(2) Smoking is authorized in designated smoking areas only.

b. **Open Flames/Ignition Sources**

(1) Open flames or other ignition source shall not be permitted in the vicinity of flammable liquids, gases, or explosive ordnance.

(2) Continuous fresh air or properly designed exhaust systems shall be provided where flammable vapors are present.

c. **Heating Units**

(1) Use caution when using element space heaters in any part of a hangar deck or in any shop where a fire hazard may be created.

(2) In no case shall such heaters be permitted in locations where concentrations of flammable or explosive substances are present.

d. **Shoes**. Personnel shall wear approved non-sparking, protective toe box safety shoes with non-slip oil and fuel resistant soles in the vicinity of flammable gases and vapors.

e. **Stowage of Combustible Materials**. Approved, correctly labeled, metal receptacles with self-closing covers shall be provided for the disposal of oily rags, waste, and other combustible materials. Approved flammable storage lockers are required for storing combustible materials.

C1203. HOUSEKEEPING

a. Clean work areas and keep them clean, during and after maintenance evolutions.

b. Keep decks free from oil, grease, and debris.

c. Properly store compressed air tanks, tools, and equipment after use.

d. **Spills**

(1) Immediately clean up oil, grease, fuels, and other flammable or slippery substances to prevent injury or fire.

(2) Use drip pans during maintenance evolutions to prevent drips and leaks from becoming fire or slip hazards, particularly under aircraft engines.

e. **Cords/Hoses**

(1) Place air hoses, power cords, and similar equipment on overhead arms or in a ramped safety trough to alleviate the trip hazards in passageways and fire lanes. This will also reduce excessive wear and damage to the cords/hoses from traffic and deck abrasion.

(2) Always straighten, coil, and properly stow cords and hoses when not in use.

C1204. FOREIGN OBJECT DAMAGE (FOD)

a. Aircraft jet engines suck up loose objects from the deck or the area immediately adjacent to the intake, including in some cases, personnel who venture too close. Ingestion of articles into engines can cause costly damage or complete loss of the engine.

b. Inspect the deck and other areas for FOD by conducting FOD walkdowns immediately prior to commencing air operations or when starting aircraft engines for maintenance.

c. Only use approved/required flight deck uniforms, cranial headgear and sound attenuators in accordance with appropriate NATOPS during flight operations. Ball caps, white hats, watch caps, garrison hats, bridge caps, or hard hats shall not be worn on the flight deck, catwalks, or gallery decks during flight operations.

d. Do not put loose objects in shirt pockets while in flight operations area. Pockets must be buttoned.

e. Prohibit dumping of trash and garbage during launch or recovery operations. Only dump trash from the fantail or designated sponsons.

C1205. LIGHTING IN HANGAR DECK AND SHOP SPACES

Ensure that proper quality and quantity of lighting is provided and operable.

C1206. AIRCRAFT CRASH AND RESCUE

a. Flight or hangar deck aircraft crash, fire, and rescue teams are manned by Air Department personnel with assistance from squadron personnel in the event of an actual aircraft crash or fire. NATOPS U.S. NAVY AIRCRAFT FIREFIGHTING AND RESCUE MANUAL (NAVAIR 00-80R-14) prescribes minimum fire-fighting and rescue operating instructions and procedures applicable to shipboard fire protection, prevention and suppression. The U.S. NAVY AIRCRAFT EMERGENCY RESCUE INFORMATION MANUAL (NAVAIR 00-80R-14-1) provides information and procedures for rescue of flight crews in the event of flight deck aircraft crashes or fires.

b. A mobile flight deck fire fighting truck is assigned as an initial response vehicle, but the primary fire fighting equipment is acqueous film forming foam (AFFF) fire hoses that are stored in catwalks on the flight deck and along the bulkheads in the hangar decks.

c. **Aviation Ordnance**

(1) Be familiar with procedures for fighting fires involving aircraft with live ammunition, missiles, bombs and ejection seats. Cooling ordnance during aircraft fires is of paramount importance.

(2) Know whether an aircraft is carrying live ammunition, where it is stowed, and the types present before beginning to fight the fire.

C1207. MOVEMENT OF AIRCRAFT

a. During heavy seas and ship's maneuvering evolutions, commanding officer, officer of the deck and air officer (air boss) permission must be granted prior to aircraft movement.

b. Be aware of all moving and fixed objects and aircraft, as well as the wingspan and height of the aircraft being moved.

c. Avoid sudden starts and stops. Extreme caution and slow speed shall be exercised.

161-521 O - 94 - 4

d. Insert chocks and tie down aircraft per NAVAIR 17-1-537 prior to disconnecting the tractor and tow bar.

(1) When seas are calm and deck motion is at a minimum, tie-down chains and chocks shall be in close proximity to the aircraft and ready for immediate use.

(2) As deck motion increases, chock walkers shall accompany the aircraft for the entire move and anytime aircraft are backed to a deck edge position.

(3) When aircraft are landed with hung ordnance, plane handlers should distance themselves further from the safe parking line.

(4) Use precautions when spotting aircraft near deck edge antennas which are coupled to HF transmitters.

(5) All aircraft movement will be controlled by qualified directors. A qualified brake rider must be in the aircraft during all aircraft moves.

e. For more detailed safety instructions on aircraft movement, consult the LPH, LHA, LHD, or CV NATOPS, as appropriate.

C1208. SERVICING AND GROUND TESTING

a. **Static Grounding**. Aircraft shall be securely and effectively connected to a low-resistance ground, before any fueling and arming services are performed.

b. **Aircraft Surface Walkways**. Use only approved and designated surface walkways when it is necessary to work on aircraft surfaces.

c. **Tool Kits**

(1) Take care to prevent tool kits or tools from endangering aircraft surfaces or being left inside the aircraft or loose on decks.

(2) Account for all tools at all times to prevent misplacement of tools. If any tool is missing, notify flight deck control and conduct an immediate search prior to reporting the work completed or "signing off" the appropriate work documents. If the tool cannot be found, comply with procedures listed in OPNAVINST 4790.2E, file a missing tool report, and complete a thorough search of the aircraft before it is released for flight.

d. **Aircraft Maintenance**

(1) Conduct a pre-operational inspection to ensure safety chains, handrails, platform or cylinder safety locks, caster swivel locks, wheel

brakes, jacks, screws, and towbars are in place and work properly before each use.

(2) Remove defective equipment from service until properly repaired.

(3) **Work Stands**. Use only approved work stands or docks for maintenance operations when access to aircraft is not possible from the ground level.

(a) Exercise extreme care when moving stands and platforms to prevent overturning or striking personnel, aircraft, or other equipment.

(b) Store work stands and related equipment in designated spaces in hangers.

(c) Inspect stands to ensure they are secured to prevent movement by wind, propeller wash, or jet blast. Use tie-downs and chocks if conditions require.

(d) Never tow a workstand in a hanger or near an aircraft without a safety observer.

(4) Inspect all equipment, and when necessary, test to determine that they are in a safe operating condition. Conduct periodic inspections in accordance with the PMS schedule.

(5) Cranial helmets are required when working from a work stand or when atop the aircraft.

C1209. ENGINE OPERATIONS

General Precautions

a. Prevent damage to equipment, or injury to personnel by jet aircraft intakes and exhaust, propellers and prop wash, and helicopter main and tail rotor blades and rotor wash.

b. Allow jet engines sufficient time to cool prior to inspection or work on these engines.

c. Do not rotate propellers on reciprocating engines by hand on a warm or hot engine as the engine may kick over and start.

d. Beware of turbo-propeller engines. Due to the low friction of these engines, propellers will turn freely for a considerable time after shutdown.

e. Prior to starting an engine in the hangar bay or high power turnups on the flight deck, ensure intake screens are installed.

f. Only start engines with a pilot or a qualified mechanic having specific authority to start engines. Only a qualified helicopter pilot shall perform engaged turns.

g. Position jet engine starting equipment (huffer) so that its exhaust is pointed in a safe direction and that the unit is separated sufficiently to avoid injuries to personnel, excessive heating of ammunition, airborne weapons and fuel tanks, damage to aircraft, or to other aircraft support equipment and materials.

h. Whenever approaching or leaving a helicopter which has its blades rotating, remain in full view of the pilot and keep in a crouched position. Unless authorized, do not work in the area of the cockpit or cabin rearward while blades are rotating. Do not attempt to approach or leave a helicopter when engaging or disengaging rotors.

i. In starting an aircraft, all challenges and signals between the person operating the starting equipment and the person at the engine controls shall be clearly understood and so indicated before action is taken by either person. Where the engines are started entirely from the cockpit, the person at the engine controls shall exchange signals with a person observing the engine from outside the aircraft. In all cases, the propeller must be declared "all clear" prior to starting. Similarly, do not engage the rotors of a helicopter unless the individual in the cockpit is assured by positive signal that the areas swept by the rotors are "all clear."

C1210. LIQUID OXYGEN

a. Liquid oxygen, often abbreviated as LOX, is a pale blue fluid which flows like water. It boils into gaseous oxygen at minus 297°F; therefore, it is capable of immediately freezing any object that comes in contact with it. When warmed to ambient temperature, liquid oxygen expands as a gas to about 860 times its liquid volume. Therefore, if a volume of the liquid were confined and allowed to warm, it would exert extremely high pressure (up to 12,000 pounds per square inch (PSI)). Because of these properties, extra safety precautions must be observed when working with liquid oxygen.

b. **Fire Protection**

(1) Keep the work area and equipment free of oil, grease, or any readily combustible material.

(2) Keep tools and clothing free of oil and grease.

(3) Ensure that the aircraft or the LOX converter when removed from the aircraft and the LOX servicing trailer are grounded.

(4) Prohibit smoking, open flames, or sparks within 50 feet of liquid or gaseous oxygen servicing trailers which are transferring or storing oxygen. Any combustion in an oxygen-rich atmosphere may be violent.

(5) Mark oxygen generation and storage spaces with a sign reading: **OXYGEN - NO SMOKING - NO OPEN FLAMES** -DO NOT BLOCK LOX JETTISON RAMPS, or an equivalent.

(6) Ensure that adequate ventilation is provided when transferring liquid oxygen to avoid an oxygen-rich atmosphere.

(7) Do not spill liquid oxygen on deck areas. In case of accidental spillage, the area should be thoroughly ventilated. Drainage of liquid oxygen must be caught in a clean drain pan and allowed to evaporate in an open area.

(8) Ensure a suitable fire extinguisher is immediately available in the LOX handling space.

(9) Ensure that only approved non-sparking tools are used when working on LOX equipment.

c. **Freezing Precautions**

(1) **Beware**. The extreme cold of LOX will instantly produce burns if held in contact with the skin.

(2) **Beware**. Frost bite or freezing will occur if the skin comes into contact with surfaces that have been cooled by LOX.

d. **Protecting Clothing**. The possibility of exposure from accidental spillage of LOX exists, therefore wear the following protective clothing:

(1) Face shield or protective goggles.

(2) White cuffless coveralls.

(3) Gloves.

(4) Molder's (style) safety shoes.

(5) Ensure that all protective clothing worn is clean and free of oil and grease.

e. **Handling Precautions**

(1) Wear clean, dry leather gloves offering insulation to cold, when handling parts of equipment which have been cooled by LOX. In the event rubber or neoprene is used, there should be a covering glove or an interlining glove worn in conjunction with the molded glove.

(2) Only handle the tubing or fittings through which the liquid oxygen is flowing when necessary, and then only with insulated gloves or other devices for protection against freezing.

(3) Do not permit LOX to flow onto any part of the body, clothes, pockets, or cuffs where it might be trapped.

(4) In the event the LOX is spilled on clothing, the clothing should be removed immediately and thoroughly aired to allow dilution of the oxygen concentration.

(5) When an uninsulated container of LOX is touched, or when there is any reason to suspect some part of the body has been frozen or chilled through contact with LOX, the area should be thoroughly washed with clean water and medical treatment should be sought immediately.

(6) Ensure that at least two persons conduct LOX operations.

(7) Protect storage containers, piping, valves, regulating equipment, and other accessories against physical damage and tampering.

C1211. ARRESTING GEAR AND BARRICADES

a. Personnel

(1) Only qualified personnel will operate or maintain arresting gear, barricades, engines, or equipment.

(2) Unauthorized personnel shall remain clear of the walkways, arresting gear machinery, spaces, and equipment.

(3) During arresting gear maintenance evolutions, all personnel shall remain clear of the bight of the wire.

b. Unlock all arresting gear engine spaces during operations.

C1212. CATAPULTS

a. Operate catapults only under the supervision of a qualified catapult officer.

b. Ensure only qualified personnel who have a thorough knowledge of catapult equipment, operations and maintenance, and air launching procedures are permitted to perform catapult operations.

c. Ensure placards are posted covering the cautions and warnings issued in the launch and recovery handbook for the equipment being used.

CHAPTER C13

MACHINERY

C1301. DISCUSSION

a. Machinery is located everywhere in your ship, from the more obvious examples of propulsion equipment in the engineroom, to the less than obvious example of galley equipment. The purpose of this chapter is to define precautions for all types of machinery. Electrical safety precautions are covered in Chapter C9.

b. All machinery has moving parts. The fact that moving parts exist means that the possibility of personnel injury is also present. While personnel injury is one aspect of machinery injury, the fact that a person has interrupted the machinery process can lead to even more disastrous accidents.

C1302. GENERAL PRECAUTIONS

a. General Precautions. Personnel must observe the safety precautions and adhere to the standard operating procedures for individual machine or ship system operations.

(1) Never place any part of the body into moving machinery.

(2) Never attempt to ride machinery which is not designed for transport.

(3) Do not wear jewelry, neckties, or loose fitting clothing while operating equipment.

(4) Wear proper protective clothing and equipment suited to the operation being performed (i.e., hearing protection, eye, hand and foot protection, dust and paint respirators).

(5) Do not wear polyester or other synthetic clothing when operating fuel fired equipment (in particular, no engineroom or fireroom personnel may wear such clothing) or while standing watch or performing maintenance in main propulsion spaces.

(6) Engineroom and fireroom personnel shall wear fire retardant coveralls with sleeves rolled down when on watch or when performing maintenance in machinery spaces where steam is circulating in piping systems or fuel fired machinery is in operation. (R

(7) Observe manufacturer's safety precautions and warning labels when handling flammable or toxic liquids; in particular, ensure that ventilation is (R

adequate. Avoid breathing toxic gases, vapors, fumes and dusts; wear proper personnel protective equipment such as goggles and respirators.

(8) Use only hand tools and work lights that are in good material condition. Electrical tools and lights shall be used only if inspected and approved. Special non-sparking and explosion-proof electrical equipment may be required in the presence of flammable solvents and fuels.

(9) Ensure that equipment is deenergized and/or depressurized and properly tagged out of service before attempting to perform repairs or preventative maintenance.

(10) When working in the vicinity of electrical equipment or electrical cables, be alert to the presence of dangerous voltages and avoid striking such equipment with tools of any kind. Should such damage inadvertently occur, report it immediately to the ship's electrical officer.

(11) Do not use compressed air to clean personnel or clothing or to perform general space clean up in lieu of vacuuming or sweeping. Compressed air may be used to clean machinery parts that have been properly disassembled provided that the supply air pressure does not exceed 30 psi and that a proper safety shield tip is used.

(12) Do not transfer in-use quantities of paints, solvents, acids, or corrosives to unapproved containers. Ensure material compatibility and proper labeling.

R) (13) Return flammable consumables to approved storage lockers or to the flammable liquid storeroom/paint locker at the end of each working day.

(14) Keep containers of flammable or volatile fluids/adhesives tightly closed when not in use.

(15) Supervisors shall ensure that personnel who incur any type of injury or who are exposed to any occupational hazard receive prompt medical attention.

(16) Promptly reinstall shaft guards, coupling guards, deck plates, handrails, flange shields, and other protective devices removed as interference immediately after completion of maintenance on machinery, piping, valves, or other system components.

R) (17) Beware of asbestos. Ensure proper handling/disposal requirements are followed (see Chapter B1). Asbestos fireproofing material is still common aboard some ships and asbestos can be found in sheet gaskets (Garlock®), spiral wound (flexitallic) gaskets, pipe hangers, clutch plates, brake pads, and some lagging.

A) (18) Do not use low pressure (LP) air to unclog flammable fluid piping systems unless a specific directive or approved procedure requires its use.

Naval Ships' Technical Manual, Chapter 505 permits using LP air for unclogging plumbing drains, but it is not applicable to flammable fluid systems.

C1303. MAINTENANCE

a. Ensure that all installed safety devices, alarms, and sensors are inspected and/or tested in accordance with scheduled Preventive Maintenance System (PMS) and other Type Commander requirements.

(1) Assign the repair of defective safety devices a high priority.

(2) Oil leaks shall be corrected at their source. Spills of any kind shall be wiped up immediately and the wiping rags disposed of immediately or stored in fire safe containers.

(3) Avoid trip hazards by maintaining proper stowage.

(4) Do not allow fire hazards to accumulate.

(5) Ensure that all firefighting equipment is kept in a maximum state of readiness at all times.

(6) Ensure repair lockers are properly outfitted and restored after each use.

(7) Continuously monitor fire and flooding alarm panels. No alarm or flag shall be allowed to go uninvestigated. Alarm panels known to give false or spurious indications shall either be labeled and repaired or replaced as soon as possible.

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(8) Open all drains and vents to all drums and headers before loosening (A
manhole or handhold plates. Stand clear of such fittings when initially opening them after service.

b. Follow quality assurance (QA) requirements for all maintenance on (A
Level A and C equipment not fully covered or supported by PMS.

c. When maintenance exceeds boundaries of PMS, appropriate supervisors shall (A
ensure the QA documentation and procedures are followed per the Forces Afloat Quality Assurance Manual (COMNAVSURFLANTINST 9090.1A/COMNAVSURFPACINST 4855.22).

C1304. BOILERS

a. Procedures in Case of Accident

(1) During major steam leaks, the upper part of the compartment will fill with steam. Avoid going up the fireroom ladders because of the great danger of being seriously injured, or being overcome by inhaling steam.

Proceed to another compartment on a lower level, if available, or proceed to the lower level on ships which are fitted with escape trunks and use this trunk to exit the space.

(2) In case of a fuel oil fire in the bilges, secure oil pumps, and isolate fuel systems.

(3) Keep the ventilation blowers running when fuel oil fires occur, even at the risk of fanning the flames, in order to fight the fire and aid personnel in escaping. If the ventilation system blowers have both supply and exhaust controls, only the supply control should be closed when a fire occurs. Close both the supply and exhaust control when the space is evacuated. Machinery spaces that utilize HALON® as a fire extinguishing agent have supply and exhaust controls interlocked with the HALON® system. The supply and exhaust fans will be automatically secured by the CO_2 charge that activates the HALON® system.

(4) Secure forced draft blowers and activate the steam smothering system in the boiler air casings in the event of a fire in the casing of an air-encased boiler.

b. **General Safety**

(1) Learn escape routes in case of fire, explosion, steam leaks, or other casualty.

(2) Keep installed/portable firefighting equipment in good working conditions.

(3) Secure all machinery space deck plates and gratings in place.

(4) Do not stow articles on engineroom and fireroom gratings. Articles may interfere with ventilation, block or obstruct passageways, or may fall through gratings.

(5) Do not permit open lights, open flames, or matches in fuel oil tanks or near fuel oil hoses and fuel oil vents.

(6) Do not allow fuel oil to accumulate on furnace bottoms, in inner casings, bilges or bilge pockets.

(7) Wipe up any spilled fuel oil immediately. Materials used for wiping which have become wet with fuel oil shall be cleaned or destroyed immediately after using, or shall be put in a covered fireproof receptacle and kept in a safe place until they can be disposed of properly.

(8) Inspect the drain holes and drip pans of air registers at least once each watch. Clean if necessary.

(9) Perforated steam smothering pipe shall be kept clean at all times.

(10) Keep all joints on fuel oil lines tight. Flange shields are to be of the approved type and properly installed.

(11) Ensure that lighting off torch pot does not leak, and remove all fuel oil from torch pots after boilers are secured and fireroom space is in "cold iron" status.

(12) Only work in a dead fireroom when adequate ventilation is provided. Special precautions shall be taken to ensure an adequate supply of fresh air in a dead fireroom if boilers in that fireroom are connected to the same stack as steaming boilers in another fireroom.

(13) Do not permit the fuel oil pressure in any part of the system, including the discharge from the fuel oil service pump, to exceed the design pressure for the particular system.

(14) Remove self-flanged thermometers from their fittings only when the boiler is not under pressure.

(15) Do not use sprayer plates larger than sizes on the allowance lists. The Naval Sea Systems Command has established for each boiler installation an allowance of ratios and sizes of sprayer plates to be used. Included in the list of sprayer plates is a size of sufficient capability for boiler overload steaming rates.

(16) Use extreme caution in locating leaks in high pressure steam piping.

c. <u>Lighting Off</u>

(1) Ships having Engineering Operational Sequencing System (EOSS) installed shall adhere to EOSS procedures when lighting off, shifting, and securing boilers.

(2) Adhere strictly to prescribed tests of safety valves. Safety valve settings shall not be increased or decreased without approval of Naval Sea Systems Command.

(3) Determine that all automatic and manual safety features have been tested and work properly.

(4) If a safety valve on any boiler cannot be adjusted to lift properly, the boiler shall not be steamed until the fault has been corrected.

(5) If a fuel oil quick closing valve or other fuel shutdown device on any boiler does not function properly, the associated boiler shall not be steamed until the fault has been corrected.

(6) Wear long-sleeved shirts with the sleeves rolled down and buttoned to alleviate burn hazards while in the firing aisle. Only cotton-type uniforms or fire retardant coveralls are to be worn by fireroom personnel. CORFAM® shoes shall not be worn in engineering spaces.

(7) Inspect the firebox for raw fuel using a suitable inspection device before lighting off or relighting a boiler. If no unburned fuel is present, purge the firebox in accordance with EOSS or other approved procedures. Raw fuel on the furnace floor cannot be removed by purging. Access to the furnace deck is required to remove all remaining fuel oil.

(8) Ensure that the stack cover is removed before lighting off.

(9) Ensure that an adequate supply of feedwater is available and lined up to feed the boiler prior to lighting fires.

(10) Use a torch and stand well clear of the burner air register and lighting off port when lighting off a boiler. Ensure that a flash guard is installed on the torch and that the lighting off torch pot is adequately secured to a structural member. Torchman will wear face shield, gloves, and welding jacket. If ignition does not occur within 3 seconds, shut the fuel oil supply valves and inspect the firebox for unburned fuel accumulations and the burner atomizer for correct installation.

(11) Keep engineroom and fireroom hatches, doors, and escape trunks clear of obstructions.

(12) Boilers known to have excessive deposits on their heating surface, or grease or other foreign matter in the water, shall not be steamed at high firing rates, except in case of emergency. Such boilers shall be cleaned and/or boiled out at the first opportunity.

d. <u>Operating Precautions</u>

(1) During steady state steaming, ensure that controlled steam pressure is within ± psig of the set point pressure.

(2) Never relight a secured boiler from a hot brick wall.

(3) Never leave secured atomizers in place. Remove them from the boilers when not in use.

(4) Always lock the damper or shutters of an electric light-off fan in the closed position when securing electric light-off fans and shifting to the oncoming forced draft blower.

(5) Be constantly on the alert for fuel oil leaks and report same immediately to the boiler technician of the watch (BTOW), who will immediately notify the engineering officer of the watch (EOOW).

(6) Only use fuel oil from a tank when the tank has been tested for bottom sediment and water (BS&W) per Chapter 541 of the NSTM, Petroleum Fuel Stowage, Use and Testing.

(7) Do not close the quick closing valve until the fuel oil pump is secured, except in an emergency when shutting down a boiler.

(8) Never shut off the feed supply even for a short period as long as a boiler is furnishing steam.

(9) Blow down water gauges if there is any doubt regarding level of water in the boiler.

(10) Take the boiler off the line per EOSS or engineering operational casualty control (EOCC) if the high or low water level alarm sounds as verified by the direct reading water level gauge glass, prior to obtaining an out of sight condition.

(11) Secure the boiler at once, whenever it is known or suspected that any refractory material has dropped out of the furnace wall.

(12) Immediately report to the EOOW if oil is discovered in a boiler gage glass and determine the source of contamination.

(13) During gunfire, stand clear of the possible path of a flareback, if in the boiler firing alley.

(14) Observe the following precautions to reduce danger of flarebacks:

(a) Do not allow fuel oil to accumulate in the furnace. When a burner is not in use, always ensure that the atomizer valve safety shut-off device (SSD) and associated root valve are properly secured.

(b) If an uncontrolled loss of fires occurs, secure the boiler. Inspect the furnace for raw fuel using a suitable boiler inspection device; purge, following the posted purge tables, then relight fires.

(c) Stand well clear of the air register to avoid injury in case of flareback when lighting off with a torch.

(d) White smoke is a potentially explosive situation, particularly under cold boiler conditions. Refer to EOCC and NSTM, Chapter 221 for casualty procedures.

(15) Never bottom blow a steaming boiler.

(16) Open the discharge connection to the auxiliary exhaust before closing the main steam and auxiliary steam stop valves when securing a boiler.

(17) Secure the burners on the superheater side prior to securing

those on the saturated side when securing a divided furnace boiler. Steam temperature should be reduced slowly, as a precaution in avoiding leakage of steam line joints.

R) (18) Wear a face shield, goggles/safety glasses, apron, and rubber gloves when injecting boiler treatment chemicals or other corrosive additives into boilers under pressure.

(19) Never attempt to empty a boiler overboard through the bottom blow sea valve.

(20) Fuel may accumulate in the boiler air casing from partially plugged atomizers, by continued drip when atomizers are secured and not removed from the burners, or by excessive carbon deposits in registers or furnace opening rings due to improperly adjusted burners. Frequently observe conditions through burner and furnace sight glasses and correct the settings of atomizers and register doors to prevent these occurrences.

(21) A fall in steam pressure without some apparent reason is a possible indication of low water.

e. <u>Precautions After Securing Boiler</u>

(1) Take steps to ensure complete absence of pressure or hot water by opening vents and drains to the drums and headers, including the superheater headers, before opening up of a boiler by removing any fittings or parts subject to pressure, or loosening a manhole plate fitting of a boiler.

(2) Always use gloves, goggles, slickers, respirators for toxic dusts, and such other equipment as advisable when using water or steam lances or steam water injectors to avoid being scalded with hot water, and to prevent any possible toxic effects of the waste water.

f. <u>Precautions in Cleaning Boilers</u>

(1) Close and secure by locking or wiring all connecting valves, then tag (red, **DANGER DO NOT OPERATE**) to prevent accidental opening of valves while working in a boiler. Ensure remote operating gear for these valves is also tagged and wired closed as appropriate.

(2) Open the superheater bilge drain valves to permit drainage of any water leaking into headers.

(3) If pressure is to be applied to any valve on an open boiler, do not enter the boiler until pressure has been applied to the valve and its tightness is positively assured.

(4) Blow down the steaming boiler to assure tightness of the valves on the idle (open) boiler prior to commencing work.

(5) Evacuate the idle boiler when permission is obtained to surface blow the steaming boiler, until the blow down is complete.

(6) Work in a boiler firebox or air casing only when the control valves for the steam smothering system are wired shut and tagged.

(7) Use explosion-proof hand flashlights in an open boiler when possible. (R
If portable electric lights must be employed, only explosion-proof, watertight lights with insulated electrical leads (Class I, Division 1, Grade D) shall be used. Test all electrical equipment and portable receptacles to be used inside a boiler according to NSTM Chapter 300, Electric Plant General.

(8) Ventilate the boiler to remove flammable vapors before performing work.

(9) Enter a boiler (steam drum, water drum, air box) after boiling (R
out only after the boiler has been thoroughly ventilated and the gas-free engineer has approved entry.

(10) Only work in the interior of a boiler when a watch is stationed outside to render assistance, as necessary, in case of accident.

(11) Observe the following precautions in applying metal conditioning compounds or fireside deposit remover compound to the firesides of a boiler.

(a) NO SMOKING, NO BURNING, and NO WELDING signs shall be posted in the fireroom and in the immediate vicinity of the boiler being cleaned.

(b) Do not apply metal conditioning compound to a boiler if another boiler in the same fireroom is on-line or if the boiler is connected to the same stack as another boiler which is steaming.

(c) Do not work in the boiler after it has been sprayed with compound. Wait until the compound has been removed by firing the boiler.

(d) Ensure excessive amounts of boiler compound which can collect in fireside pockets are avoided by not over spraying effected areas.

(e) Do not place a boiler treated with fireside removal compounds on a steam blanket layup.

(12) Remove all jewelry, watches, chains, cigarette lighters, pens, and other similar items which have the potential of being dropped into economizer and boiler tubes prior to entering a boiler. Wear personal protective equipment (coveralls, gloves, headcover, and respirator if necessary) if entering the interiors of boilers to prevent skin contact and

inhalation of cleaning-conditioning compounds and dust. The gas-free engineer shall approve entry into the boiler.

(13) Inspect the interior of the boiler before closing to ensure that no person is left inside, and that the boiler, including economizer and superheater headers, are free from tools, loose material, and foreign matter.

A) (14) Station a person outside the boiler to render assistance in case of accident, whenever personnel are working in the boiler interior.

A) (15) Wire and tag in a closed position valves to the steam smothering system while personnel are working in the area. Remove tags and return valves to ready position when work is complete.

A) (16) Place warning signs (CAUTION - PERSONNEL WORKING IN BOILER INTERIOR) at the top fireroom watch station when personnel are working inside a boiler. Do not remove signs until it is determined by the EOOW or EDO that all personnel are clear of the secured boiler.

A) (17) Visually inspect drain connections to the atmosphere on all dead interconnecting piping to ensure drainage.

A) (18) Observe the following precautions before starting work if the cold boiler is connected to the same smoke pipe as steaming boilers in another fireroom:

(a) Take special precautions to ensure an adequate supply of fresh air in the dead fireroom.

(b) Do not perform any work involving opening of the uptake doors or furnace doors unless the ship is equipped with division plates to provide each boiler with an individual gas passage to the top of the smoke pipe.

C1305. INDUSTRIAL EQUIPMENT

a. General Industrial Equipment Operation and Repair Safety

(1) Read manufacturer's instruction books for essential details of readying machines and equipment for operation, cleaning, lubricating, and general care and maintenance. These instruction books, supplemented by technical handbooks, provide comprehensive instructions on all phases of shop practice.

(2) Inspect before operating industrial equipment (fixed or portable) to ensure that the equipment is in good working condition and that all installed or attached safety features (such as guards, limit switches, interlocks, and speed limiting controls) are in place and in good working order.

(3) Unplug or disconnect from power source and affix a red tag (DANGER - DO NOT OPERATE) on all fixed or portable industrial equipment requiring repairs.

(4) Shut off the power when changing industrial equipment parts such as face plates or chucks on lathes or drill bits in electric drills.

(5) Block up ram where applicable and open the switches and red tag (DANGER - DO NOT OPERATE) on power shears, drills, punches, and presses when it becomes necessary to place any part of the body underneath or within the equipment.

(6) Replace machine guards and safety devices after repairing, oiling or greasing, or after inspections or PMS have been completed before the machine is started or operated.

(7) Remove all industrial tools or test equipment used in making repairs, adjustments to machinery, or other shipboard equipment/systems so that all working parts of the machinery, equipment, or system will be free to operate without damage.

(8) Take care that no one is in a position to be injured when the machinery/equipment/system is again set in operation.

(9) Be sure all personnel are clear before starting any industrial tools or equipment.

(10) Do not permit anyone to operate electrical or mechanical equipment or machines in any space when alone.

(11) Make sure there is plenty of light to work by before operating a machine.

(12) See that tools and work are properly clamped before starting a machine.

(13) Only place/mount a saw, cutter head, grinding wheel, or tool collar on a machine arbor when the tool is the proper size to fit the arbor.

(14) Ensure each powered machine has a means of cutting off power which can be safely reached and operated from the operator's normal position, without reaching through the point of operation or other hazardous areas.

(15) On machines where injury to personnel might result if motors were to restart after power failures, check that provisions have been made to prevent machines from automatically restarting upon restoration of power.

(16) Make sure that operating controls, including treadles, are protected by recessing, guarding, location, or other effective means against unexpected or accidental activation of the machine.

(17) The point operation is the area of a machine where the work is actually performed upon the material being processed. Check that the point-of-operation is guarded so that personnel cannot be injured by contact with the machine or by flying objects propelled from the machine. Methods of point-of-operation guarding include barriers, shields, interlocks, automatic feed and removal, and two-hand activation devices. The best guarding device is usually one designed and attached by the manufacturer as an integral part of the machine. The selection and design of guards other than those provided by the manufacturer must be adequate to protect personnel and not present a hazard in themselves.

(18) Power transmission devices include belts, chains, pulleys, shafting, fly wheels, gears, sprockets, and any other moving parts of a machine other than the point of operation. Ensure that power transmission devices are enclosed within the machine or otherwise guarded or so located that it is not possible for personnel to contact the moving parts. Power transmission devices over 7 feet above the deck or other standing/walking surface need not be guarded.

b. **Housekeeping**

(1) Keep areas around machines clear of obstructions and in a non-slippery condition. Clean up all spilled oil or grease immediately.

(2) Keep machines clean.

(3) Do not clean chips from the surface of machines with compressed air or with hands; use a brush or hook and wear leather gloves.

(4) Do not use compressed air to clean clothing or to blow dust off the body or to assist in the clean up of dust, debris, or other particulate matter.

(5) Do not place hand tools on lathes or other machines. Keep them in their assigned location.

(6) Turn off all power to the equipment before removing chips and other debris.

(7) Ensure that all portable tools (electrical or pneumatic) have been tested prior to initial use and periodically, as prescribed by PMS or other data.

(8) Ensure that all machine guards and other safety devices are in place prior to equipment operation.

c. **Portable Power Tools**

(1) Ensure all portable electric power tools have a current safety inspection by the electrical tool issue room prior to use.

(2) Ensure that portable circular saws, electric or pneumatic chain saws, and percussion tools without positive accessory holding are equipped with an operable "deadman" switch.

(3) Keep portable power tools clean, lubricated, and in good repair.

(4) Keep all electrical cords clear of moving parts when using portable electrical equipment around machine tools.

d. **Operating Precautions - General**

(1) Remove chuck keys, wrenches, or other devices used to attach accessories to industrial machines before operating.

(2) Do not attempt to adjust a tool or feel the edge to be cut while the equipment or tool is in motion.

(3) Never attempt to stop or grab by hand or apply a wrench or tool to moving work or to moving industrial equipment parts.

(4) Do not use hangers to knock cutters into positions.

(5) Never lean against a machine that is running.

(6) Never leave moving machinery unattended.

(7) Do not distract the attention of a machine operator.

(8) Remove cutting tools from machines when not in use.

(9) Avoid excessive cutting speeds, feeds, and depth of cut. Keep hands clear of moving parts. Use a separate block to feed stock into cutting blades.

e. **Securing for Sea**

When securing for sea, take all precautions to ensure that components of industrial equipment or tools, including accessories, will not sway or shift with the motion of the ship. These precautions should include, but are not limited to, the following:

(1) Lower the arm of top-heavy equipment, such as a radial drill press, to rest on the table or base of the machine and then clamp and block securely.

(2) Secure chain falls, trolleys, overhead cranes, and other suspended equipment, such as counterweights on boring mills and drill presses.

(3) Secure tailstocks of lathes.

(4) Secure spindles of horizontal boring mills.

(5) Protect and secure tools stowed in cabinets or drawers. Secure drawers and cabinet doors.

(6) Inspect foundation bolts of heavy equipment annually to ensure tightness.

(7) While underway or while at anchor in high sea states, do not operate shop machines whose components are subject to shifting or swaying with the motion of the ship, so as to present a hazard to operators, without the expressed permission of the commanding officer. In addition, such operations as the melting and pouring of metal or similarly dangerous evolutions shall not be performed while the ship is underway.

f. **Posted Safety Precautions**

(1) Post operating instructions and safety precautions tailored to the specific equipment at each piece of industrial plant equipment. Install warning plates, located to ensure visibility, wherever necessary to minimize possible injury. Also, instructions to never allow machines to run unattended and not to distract the operator while the machine is in operation are appropriate.

(2) Equipment hazard zones should be clearly established and marked per ship's plans and specifications or General Specifications for Ships, section 602j.

g. **Safety Precautions for Specific Types of Equipment**

(1) **Pneumatic Tools - General**

(a) Wear and use necessary personnel protective devices.

(b) Do not connect or drive pneumatic tools by air pressure in excess of that for which the tools are designed.

(c) Only authorized and trained personnel shall operate pneumatic tools.

(d) Lay pneumatic tools down in such a manner that no harm can be done if the switch is accidentally tripped. Do not leave idle tools in a standing position.

(e) Keep pneumatic tools in good operating condition and thoroughly inspect them at regular intervals with particular attention given to on-off control valve trigger guard (if installed), hose connections, guide clips on hammers, and the chucks of reamers and drills.

(f) Pneumatic tools and air lines may be fitted with quick disconnect fittings which incorporate automatic excess flow shut-off valves, which shuts off the air at the air lines before changing grinding wheels, needles, chisels, or other cutting or drilling bits.

(g) Only use air hose which is suitable to withstand the pressure required for the tool. Remove leaking or defective hoses from service.

(h) Do not lay hoses over ladders, steps, scaffolds, or walkways in such a manner as to create a trip hazard. Where a hose is run through doorways, protect the hose against damage by the door edge. Preferably, elevate air hose over walkways or working surfaces in a manner to permit clear passage and prevent damage to the hose.

(i) Connect a tool retainer on each piece of equipment which, without such a retainer, may eject the tool.

(j) Ensure that all portable pneumatic grinders and reciprocating saws are equipped with a safety lock-off device. The lock-off device must automatically and positively lock the throttle in the off position when the throttle is released.

(k) Pneumatic tool air hose fittings shall not fit the hose fittings designated for air line respirators.

(l) Ensure that air hoses are equipped with "quick disconnect" fittings at all hatches, doors, or scuttles.

(2) <u>Pneumatic Hammers</u>

(a) Do not point any pneumatic hammer at other personnel. Hammers shall be operated in a careful and safe manner at all times.

(b) Ensure that all hammers are equipped with a device for holding the tool bit in the hammer. Inspect safety tool holders at frequent intervals in accordance with PMS.

(c) Do not restrict the air exhaust in any fashion.

(d) Ensure that all pneumatic hammers are equipped with a hand-whip safety switch (deadman switch).

(e) Use pneumatic hammers only for those purposes for which designed.

(f) When operating a power hammer, wear necessary eye, face, ear, and body protection, including gloves.

(3) **Power Saws**. In addition to the general precautions for portable electric and pneumatic tools contained in this manual, observe the following precautions for electric and pneumatic saws:

(a) Provide all circular power saws with guards that fully encompass the unused portion of the blades.

(b) Ensure that circular saw blades are installed by qualified personnel.

(c) Only use portable electric or pneumatic saws which have handgrip "deadman" switches installed.

(d) Grasp portable power saws with both hands and hold firmly against the work. Care shall be taken that the saw does not break away, thereby causing injury.

(e) Disconnect the power supply and inspect the blade at frequent intervals or immediately after it has locked, pinched, or burned.

(f) Inspect and remove potential obstacles from the material to be cut before using a saw.

(g) Immediately remove dull, badly set, improperly filed, or improperly tensioned saws from service before they can begin to cause the material to stick, jam, or kickback when it is fed to the saw at normal speed.

(h) Immediately clean saws to which gum has adhered to the sides. Disconnect power before cleaning.

(i) Keep bearings well lubricated.

(j) Keep arbors of all circular saws free from play.

(k) Only designated personnel with certified skill shall sharpen or tension saw blades or cutters.

(l) Maintain cleanliness around woodworking machinery, particularly as regards the effective functioning of guards and the prevention of fire hazards in switch enclosures, bearings, and motors.

(m) Remove all cracked saws from service.

(n) The practice of inserting wedges between the saw disk and the collar to form what is commonly known as a "wobble saw" shall not be permitted.

(o) Provide push sticks or push blocks at the work place in the several sizes and types suitable for the work to be done. Push sticks, blocks, or other special hand tools are not substitutes for guards. All required guards must be kept in place and operable when push sticks or blocks are used.

(p) On band saws, ensure all portions of the blade are enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. The portion of the guard between the upper-saw-wheel guard and the guide rolls must guard the front and outer side of the blade and must be adjustable to move with the guide as it is raised and lowered. When the band saw is in use, the adjustable guard must be positioned so that the minimum clearance consistent with free movement of the material being cut is maintained between the guide rolls and the material.

(q) To avoid vibration, welded joints in bandsaws shall be the same thickness as the saw blade.

(r) Ensure that each circular table saw is guarded by a hood which completely encloses the portion of the saw above the table and above the material being cut. The hood must be mounted so that it will automatically adjust itself to the thickness of, and remain in contact with, the material being cut. An approved clear plastic guard cantilevered over the saw table may be used as an alternative to the enclosing hood. The plastic guard must be large enough and set low enough to prevent the hands of personnel from contacting the blade.

(s) Make sure that each hand-fed rip saw has a spreader mounted in a position one-half inch from the back of the largest saw which may be mounted on the machine. The spreader prevents material from squeezing the saw and being thrown back on the operator. The spreader shall be thinner than the saw kerf and rigid enough to resist side thrust and bending. The spreader is not required for grooving, dadoing, or rabbeting but must be replaced immediately upon completion of such operations.

(t) Check that each ripsaw, including hand-fed rip saws with spreaders, are provided with non-kickback fingers or dogs to prevent material from being thrown toward the operator.

(u) Ensure that self-feed circular saws have a hood or guard which will prevent the operator's hands from contacting the nip point of the feed rolls.

(v) Verify that radial saws are guarded, as required by the following subparagraphs:

1. The upper portion of the blade, including the arbor, must be completely enclosed by a hood. The sides of the lower portion of the blade must be guarded to the full diameter of the blade by a guard that will automatically adjust to the thickness of the material being cut.

2. The work surface must be wide enough, or a stop shall be provided, to prevent the cutting head from traveling to a point where the blade extends beyond the outer edge of the table.

3. The unit shall be tilted back or counterweights shall be provided so that the cutting head will return to the starting position when released.

4. Ripping and ploughing with a radial saw must be against the direction that the saw rotates. The direction of rotation must be conspicuously marked on the hood. A label shall be affixed to the rear of the hood reading "**DANGER: Do not rip or plough from this end.**" Non-kickback fingers must be provided for ripping and ploughing operations.

(w) Inspect saw blades by non-destructive, PMS test methods for surface cracks and defects.

(4) **Sanding Machines**

(a) Carefully inspect all sanders before use. Do not use sanding discs or belts if they are frayed or cracked.

(b) Use goggles and disposable dust respirator during sanding operations and while cleaning up. Dust collecting systems for sanders, if installed, must be operating when sanding is in progress.

(c) Keep hands or other parts of the body from coming into contact with the abrasive surface of the sander.

(d) Grasp portable hand-held sanders with both hands and hold firmly against the work. Take care that the sander does not break away, thereby causing injury or damage.

(e) When permanently mounted sanders are used, grasp the work firmly and hold it to the sanding surface carefully to avoid finger contact with the sanding belt or disc. Sand small pieces of work that would bring the fingers within 1 inch of the belt or disc surface by hand, rather than on powered sanders.

(f) For portable sanders and fixed sanders having electric plugs, pull the electric plug before sanding belts or discs are changed or before repairs or adjustments are made to the sander. Open and DANGER tag the power source circuit breaker of fixed sanders that are "hard wired" before making repairs or adjustments or changing belts or discs.

(g) Ensure each belt sanding machine has both belt pulleys enclosed in such manner as to guard the points where the sanding belt runs onto the pulleys. Enclose the unused run of the sanding belt. Adjust belt type sanders to the proper tension.

(h) Ensure coast down brakes, where installed by the manufacturer, are in good working condition before commencement of sanding and use them to stop belt or disc motion after the power is secured.

(5) <u>Buffers, Grinders, and Cut-Off Wheels - General</u>

(a) Check the spindle speed of the machine before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.

(b) Gently tap wheels with a light non-metallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels, immediately before mounting. If they sound cracked (dead) they shall not be used. This is known as the "ring test." It should also be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.

(c) Wheels must be dry and free from sawdust when applying the "ring test," otherwise the sound will be deadened.

(d) Dress or replace wheels that are chipped, rounded, or worn out of round prior to using the grinder.

(e) Replace fabric buffer wheels that are frayed or worn out of round.

(f) Replace wire buffer wheels that are badly worn or loose at the hub.

(g) Permanently mounted buffers and grinders shall have a shatterproof safety shield in place between the operator's eyes and the work at all times while buffing and grinding. Wear face shields when operating either portable or permanently mounted buffers or grinders.

(h) Clean the flange surface of grinding and buffing wheels, normally placed between washers and the spindle hole, before mounting the wheel so that clamping pressure will be evenly distributed.

(i) Ensure that the hole in the buffer or grinding wheel is of the proper size for spindle (neither too small nor too large).

(j) Use compression washers as large as the flanges in diameter for buffer and grinding wheels.

(k) Tighten spindle nuts just enough to keep the buffer or grinding wheel from moving out of position between the washers.

(l) Mount tool or work rests on firm supports and space not more than one-eighth of an inch from the surface of grinding wheel.

(m) Ensure that the hood around grinding wheels is constructed so its periphery can be adjusted to the constantly decreasing diameter of the wheel by means of an adjustable tongue or equivalent. Maintain the distance between the wheel periphery and the tongue or end of the periphery band at approximately one-fourth of an inch.

(n) Ensure that the upper point of opening in the grinding wheel hood facing the operator is not less than 25 degrees and not more than 65 degrees from a vertical line drawn through the spindle center.

(o) Ensure that the maximum exposure of a grinding or cut-off wheel periphery or circumference for hoods on a swing frame machine does not exceed 180 degrees and the top half of the wheel is protected at all times.

(p) Ensure that the maximum exposure of the wheel periphery or circumference on bench or floor stands does not exceed 90 degrees.

(q) Protect cup type wheels used for external grinding by either a movable cup guard or a band type guard. Provide all other portable abrasive wheels used for external grinding with safety guards (protection hoods), except as follows:

1. When the work location makes it impractical, use a wheel equipped with safety flanges.

2. When using wheels 2 inches or less in diameter, securely mount the wheel on the end of a steel mandrel.

(r) When safety flanges are required, use them only with wheels designed to fit the flanges. Use only safety flanges of a type and design and properly assembled as to ensure that the pieces of the wheel will be retained in case of accidental breakage.

(s) Ensure portable abrasive wheels used for internal grinding are provided with safety flanges (protection flanges), except as follows:

1. When wheels are 2 inches or less in diameter, securely mount on the end of a steel mandrel.

2. If the wheel is entirely within the work area being ground.

(t) Ensure that all deck or bench mounted abrasive wheels have a work rest. Keep the work rest adjusted to within one-eighth inch of the wheel periphery to prevent the work from being jammed between the rest and the wheel.

(6) Operating Grinding, Buffing, and Cut-Off Wheels

(a) Stand to one side of the wheel when first applying power.

(b) Take care that the hands are not drawn into contact with buffing, grinding, and cut-off wheels.

(c) Never operate stationary grinding wheels unless protective eye guards and hooks are in their place and the tool rest is correctly adjusted.

(d) Never operate portable pneumatic or electric grinding machines using wheels and wire brushes without a hood.

(e) Before the power is turned on, check to ascertain that the wheel runs true, is not out of balance, and does not strike or rub against housing, hood, safety shield, or tool rest. Dress wheels as necessary.

(f) Never use a grinding wheel on nonferrous materials.

(7) Explosive Actuated Tools

(a) Ensure that explosive actuated tools (e.g., velocity power cutters, mine-sweeping cable cutters, stud drivers, and velocity power swagging tools) are operated, repaired, serviced, and handled only by personnel who have been trained and certified by the manufacturer, their authorized representative, or Navy certified instructors. Certification of operators of explosive-actuated tools shall meet the requirements of OPNAVINST 8023.2C, U.S. Navy Explosives Safety Policies, Requirements and Procedures.

(b) Ensure that the tool operator, together with other personnel in the vicinity, wear safety goggles or other approved safety type face and eye protective devices and a hard hat.

(c) Secure explosive actuated tools and the explosive charges to prevent unauthorized use.

(d) Upon the detection of a defect in the operation of an explosive-actuated tool, remove the tool from service and DANGER tag until the deficiency is corrected.

(e) Inspect explosive actuated tools for worn or damaged parts at intervals specified by manufacturer's instructions or the PMS, whichever is appropriate. This inspection shall be noted and dated on the tool inspection record.

(8) Industrial Radiographic (X-Ray) Equipment

(a) Do not operate industrial radiographic equipment of any type until the equipment operators have first met the licensing requirements of the

Nuclear Regulatory Commission (Title 10 Code of Federal Regulations) and the requirements of NAVMED P-5055 for use of electromagnetic (x-ray) equipment or radioactive byproduct gamma radiation sources. See Chapter B9 for information on the radiation safety program.

(b) Ensure the ship:

1. Is licensed by Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Office (RASO), Naval Weapons Station (NWS) Yorktown to operate such equipment.

2. Designates a ship's officer to supervise such operations.

3. Qualifies radiographic equipment operators.

4. Establishes written procedures for the maintenance and inspection of radiographic equipment and emergency procedures to be followed in any case of uncontrolled or unplanned exposure of personnel.

5. Has and maintains in first class condition appropriate radiation alarms, radiation survey equipment, and personnel monitoring devices.

6. Has written procedures for every radiographic exposure which describe the boundary controls used to limit personnel access, the monitoring and alarm controls used for detection of radiation, and a diagram of the exposure set-up which accurately describes the intensity and duration of an object's exposure to radiation.

(c) Ensure that written instructions and procedures cover, as a minimum, the following topics:

1. Standards to be maintained and procedures to be followed to protect personnel against radiation.

2. Equipment inspection and maintenance requirements.

3. Inventory controls.

4. Storage precautions.

5. Equipment operating procedures and safety precautions.

6. Radiation survey instrumentation care and usage requirements.

7. Care and testing of radiation alarms.

8. Equipment utilization logs.

9. Action to be taken and reports to be made in case of any unplanned exposure or overexposure of personnel to alpha, beta, gamma, or other atomic particle radiation.

(9) **Paint Spray Booths**. A paint spray booth is a ventilated structure provided to enclose a spraying operation, to confine and limit the escape of spray, vapor, and residue and direct them safely to an exhaust system. Paint spray booths are installed in tenders and repair ships (AR, AS, and AD). They are typically found in carpenter shops, optical shops, and typewriter shops. Spray booths are commercially manufactured in a variety of forms. The two types installed aboard ship are the water wash type and the dry filter type.

(a) For safe operation of paint spray booths, maintain the filtering medium. If paint spray is not filtered out, it will collect in the exhaust fan and ducting, creating a potential fire hazard.

(b) Do not allow paint residue and sludge that collects in the settling tank to accumulate. **This material is flammable** and should be properly put in closed metal containers for disposal. Chemical additives are used in the water to treat the residues so they may be skimmed off the water surface. See Chapter B3, "Hazardous Materials Control and Management Program." (R

C1306. SHIPBOARD INCINERATORS (A

The following procedures should be followed to minimize risks associated with the operation of shipboard incinerators. These procedures apply to ships with VENTOMATIC and BRULE incinerators.

NOTE:

> These procedure apply to the incineration of non-plastic and non-hazardous garbage only. Incineration of plastics aboard ship with current incinerators is not permitted

a. All operators shall be thoroughly familiar with OPNAVINST 5090.1B, Chapter 19; NSTM Chapter 593, section 2, Trash Incinerator Operating Sequencing System (TIOSS); and the safety precautions applicable to the incinerator. This includes personnel not normally responsible for incinerator operation and maintenance but are responsible for incinerating work center or divisional trash.

b. Personnel operating an incinerator shall know how to use the fire extinguisher and how to activate the sprinkler system.

c. When operating the incinerator, operators who are directly exposed to the flames in the fire box shall wear leather or fireman's gloves (gauntlet type), safety glasses, face shield, and coveralls with long sleeves and buttoned at the neck. Safety glasses must be worn with the face shield. Face shields alone do not provide adequate protection.

d. Incinerators shall not be operated while in port or within 3 nautical miles (nm) of land.

e. **Incinerator Operation**

(1) Place a small amount of paper into the incinerator firebox and light.

(2) After the fire has started, turn on all fans and check that each fan is running.

(3) Open and inspect all trash bags for batteries, aerosol cans, metal, glass, plastics, CO_2 cartridges, heavily oil/fuel/grease-soaked rags prior to placing them into the firebox.

NOTE:

Operators shall report to their supervisor any work center or division bringing any trash with batteries or aerosol cans to the incinerator. Segregation of trash must start at the work-center.

(4) Add trash and maintain the trash level half way between the grating and the air intakes.

NOTE:

After MACHALT ECP410 has been installed on ships with non-fuel-fired incinerators, the trash level may be increased up to the centerline of the firedoor providing the maximum allowable stack temperature does not exceed 650°F.

(5) Rake the trash in the firebox as required to maintain good burning. This is not applicable to ships with automatic trash feeders.

(6) Keep the firedoor closed as much as possible. Only personnel wearing the personnel protective equipment specified in paragraph 1306c shall be allowed in front of the incinerator when the firedoor is opened.

(7) Do not overfeed the incinerator. The incinerator is being overfed when flames can be seen being drawn into the spark arrester.

(8) Do not leave the incinerator unattended while in operation.

(9) Do not store trash or allow trash to accumulate in the incinerator space. Trash stored in the incinerator space increases the potential for a space fire.

(10) Do not allow personnel to sort trash in the incinerator space.

(11) When securing the incinerator, run fans for 1 half hour after the trash has burnt down and no visible embers are evident.

f. **Maintenance**

(1) Clean out the ash pit after each use. Operators shall wear a respirator with a high efficiency particulate air (HEPA) filter and goggles when handling incinerator ash. The overboard discharge of ash from the incineration of non-plastic and non-hazardous garbage only shall be considered as unpulped trash and disposed of overboard beyond 25 nm from land after being wetted down. If incinerator operations are conducted less than 25 nm from land or in International Maritime Convention for the Prevention of Pollution from Ships (MARPOL) in effect "special areas," and the ash pit is cleaned out, store wetted ash in a steel drum for later at-sea or shore disposal. If disposal is not anticipated for 5 days or more, the steel drum containing the ash should be periodically inspected for leaks. If a leak occurs, overpack the drum with a corrosion resistant overpack drum.

CAUTION:

Salt water and ash will form a weak acid. The prolonged contact of this mixture with a metal container may cause corrosion resulting in an eventual leak.

(2) Clean the spark arrester ash pit after approximately 72 hours of operation.

(3) Inspect the traverse (flue) between the firebox and the spark arrester monthly for signs of any spark arrester deterioration.

(4) Test the sprinklers quarterly.

(5) **For CVN-68 Class ships only**: clean the plenum box located in the sponson void monthly.

CHAPTER C14

ORDNANCE

C1401. DISCUSSION

a. By mission definition most naval vessels carry some type of ordnance for offensive or defensive operations. Ordnance can take the traditional form of shells for large and small caliber guns, or it can be in the form of missile warheads, torpedoes, and nuclear weapons. Generally, every Navy vessel has some sort of ordnance on board, ordnance that has the inherent power to destroy a ship, and if alongside a dock, to seriously damage other ships and facilities.

b. The greatest danger from ordnance is explosion. Due to built-in safety devices, ordnance requires outside intervention to set it off unintentionally. Improper handling, fire, excessive heat, or simple misjudgment or mistakes can cause a weapon discharge. The major safety factor in preventing an ordnance catastrophe is a well experienced and knowledgeable person-in-charge that can identify and correct potential safety hazards. This supervisor must be assisted by a crew that knows and understands the basics of ordnance safety and which has a real respect for ordnance hazards.

C1402. GENERAL ORDNANCE PRECAUTIONS

a. Do not smoke or allow open flames near ordnance.

b. If ordnance leaks any material, stop operations immediately; remove leaky ordnance and clean up spill as required for the specific explosive. Reference C14-1 prescribes the minimum safety requirements and regulations for handling and storing conventional ammunition by units afloat.

c. Use ordnance for its designated purposes only.

d. Ensure firefighting equipment is available near ordnance operations.

e. Do not eat or drink near ordnance.

f. Know and understand decontamination methods if handling chemical ordnance.

g. Get immediate first aid if splashed with rocket fuel or oxidizer.

h. Never enter a space where rocket propellant leaks are suspected without having a gas-free survey conducted.

i. Report all mishaps immediately to your supervisor.

j. Do not attempt to alter or modify ordnance in any way.

k. Use only authorized equipment on ordnance to perform any operation. Do not use improvised equipment.

l. Ground weapons during assembly, disassembly, and checkout.

m. Do not engage in operations involving ordnance which are within a 10-mile radius of thunderstorms or high winds.

n. Use approved standard operating procedures (SOPs) for all hazardous operations. Discuss such procedures with all personnel concerned and post in the shop spaces specifically designated as ordnance shops, handling rooms or check-out areas. Do not post SOPs in areas where they will present a potential safety hazard, such as the flight deck and hangar deck of a carrier, main deck of DDs, FFs, CGs, and handling areas of AE/AOE class ships.

o. Personal Protective Equipment

(1) Wear ear protection if handling ordnance during firing exercises.

(2) Wear non-skid, steel toed safety shoes when working with ordnance.

(3) Have thick leather gloves available when working with ordnance containing white phosphorus in the event of a fire.

(4) Ensure that sufficient emergency equipment is available for personnel use in an ordnance emergency. SOPs shall define the types and numbers of protective equipment required for an evolution. Instruct personnel on the purpose and use of protective equipment prior to engaging in an operation requiring its use.

(5) Clean protective clothing and equipment after each use, prior to stowage, to eliminate all traces of contamination. Inspect clothing and equipment prior to use for damage, deterioration, or other defects. Reject any item not completely satisfactory.

p. Safety Devices

(1) Use safety devices as intended by design. Inspect safety devices frequently for proper operating condition, and maintain them in good working order at all times. Do not bypass or disable safety devices unless specifically directed by COMNAVSEASYSCOM.

(2) Keep safety devices of ordnance items in the "safe" or "unarmed" position until the specified time for arming. Specific instructions for each ordnance item have been promulgated by COMNAVSEASYSCOM or COMNAVAIRSYSCOM.

q. Do not use portable electric tools in any area containing exposed explosives.

r. Use ordnance only for the purpose and in the manner specified.

s. If artificial light is required for examination or handling of ordnance or ammunition, use Underwriters Laboratory approved flashlights for specific hazardous locations, magazine lanterns, and standard lighting fixtures only.

t. Do not handle, store, or use ordnance or ordnance components unless items are specifically identified and their hazard characteristics are completely known. Only explosive ordnance disposal (EOD) personnel shall handle unidentified ordnance.

u. Electric Safety and Ordnance

(1) Only use electrical/electronic equipment and devices approved by COMNAVSEASYSCOM/COMNAVAIRSYSCOM in operations involving ordnance and ordnance components.

(2) Keep the covers of electrical switches, circuit breakers, and similar electrical devices closed at all times when any explosive material is exposed in the vicinity.

(3) Be aware of the hazards of electromagnetic radiation to ordnance (HERO) restrictions associated with each type of ordnance to prevent unintended initiation of electro-explosive devices.

v. Chemical Safety

(1) Ensure portable detectors are available for use to monitor areas in which chemical agents or liquid propellants are handled and do not have permanently installed detection systems, or where any doubt exists regarding the proper operation of such systems. Ensure personnel assigned to use detectors are properly trained and qualified in the operation, and the prescribed protective clothing and appropriate breathing apparatus and other protective devices are worn when performing detection surveys. As soon as the atmosphere in an area is determined to be toxic, sound an alarm and evacuate all personnel not properly dressed and equipped to prevent contamination and exposure from the area immediately. Notify the commanding officer immediately in case of chemical agent contamination.

(2) Use two-person teams in maximum protection outfits as a minimum for investigating areas or spaces in which liquid propellant leaks are suspected or are known to be present. The second person in the team shall carry a fire hose and follow about 15 or 20 feet after the first person. The leading person shall direct the application of water, by the hose team using prearranged signals.

(3) Know the location of safety showers, how to get to them quickly in an emergency, and how to operate them. In the event of exposure to leakage of the prepackaged liquid propellant units, shower after the handling assignment is completed to ensure that no contamination remains on the skin.

161-521 O - 94 - 5

R) (4) Only use an approved self-contained breathing apparatus in the presence of liquid propellant vapors. Do not use gas masks with general purpose canisters. Do not use an oxygen breathing apparatus (OBA).

(5) When entering a contaminated space for the purpose of locating or removing a leaky engine section, wear the general purpose impermeable suit and the self-contained breathing apparatus.

(6) Wet the entire exterior of the maximum protection suit with water before entering an area or space where accidental contact with fuels, oxidizers, or both is a possibility.

(7) Do not perform functions such as assembly, checkout, and maintenance on liquid engines on or in the vicinity of the mess deck.

(8) Paint or mount the following statement above the sighting opening of each liquid propellant magazine door: BEFORE OPENING THIS DOOR, EXAMINE THE MAGAZINE INTERIOR FOR FUMES OR FIRES.

(9) Do not use solvents to clean Otto fuel spills from the skin. Solvents will speed up the absorption of the Otto fuel into the skin and magnify the effects of exposure.

w. Do not disassemble or modify any nuclear weapon assembly or component except as specifically authorized by the applicable Special Weapons Ordnance Publication (SWOP).

x. Do not leave exposed ordnance unattended. Do not leave open magazines or lockers unattended.

C1403. ORDNANCE HANDLING PRECAUTIONS

R) a. Keep ordnance handling to a minimum and conduct handling with utmost care using certified/qualified personnel, approved equipment, and established procedures. Ensure a safety brief is held prior to ordnance handling operations. This brief shall cover all the duties and responsibilities of personnel involved and details of the operation.

b. Keep ordnance handling parties small. The number of personnel engaged in ordnance handling shall be limited to the minimum necessary for safe and efficient work performance. Working parties must be briefed on related safety instructions and be under the control of certified/qualified personnel.

c. Do not compete with other handling parties.

d. Ensure that warning signs are posted during ordnance handling operations.

e. Ensure that "BRAVO" flag is flying during ordnance cargo handling operations or a red task light is displayed at night.

f. Never handle ordnance that is "armed" or whose safety device is off, unless directed otherwise.

g. Do not move cracked, dented, deformed, corroded, or otherwise damaged ordnance. Contact supervisory personnel immediately.

h. Thoroughly wash hands after handling ordnance.

i. Do not allow any other cargo handling operations to take place in the area where ordnance handling is taking place.

j. Never use bale hooks to handle ammunition. Only use moused snap-type hooks.

k. Never use cargo nets alone to handle ordnance.

l. Use canvas to pad wire slings that come into physical contact with ordnance during handling operations.

m. Use chutes only when necessary, and then, only with heavy matting.

n. Never slide major caliber projectiles down a slide without restraining lines. Projectile bases should face the lower end of the slide.

o. When receiving or issuing ammunition to or from a shore activity or another ship, a qualified officer of the ship's company shall be designated safety officer for ammunition handling within the ship.

p. Prior to or upon arrival of a Navy ship at a pier for loading or off-loading of ammunition or other hazardous material, hold a conference to plan for the coordination of safety procedures on the pier and on board the ship.

q. If the loading or unloading operation is not completed during the working day or if the operation is discontinued temporarily, take precautions to guard hazardous material and to protect against fire or unnecessary exposure to inclement weather or direct rays of the sun.

r. During ammunition receipt or issue aboard ship, install adequate fire fighting equipment at appropriate locations and maintain in usable condition. Ensure personnel engaged in the handling operation know the location of nearby fire extinguishers and are familiar with the types to be used for various kinds of fires. Ensure that access to fire extinguishers, fire hoses, strikers, fire blankets, and other safety equipment is not obstructed.

s. Where ammunition handling operations are being conducted through a ship's hatch, do not work other cargo in the hold serviced by that hatch. Keep the ship as tight as practicable so that an inadvertent casualty in one space will not be transmitted easily to other spaces. Do not disable, bypass, alter, or make inoperative safety interlocks.

t. Assign personnel to guide ordnance through scuttles or hatches. Install one inch pads on edges of openings.

u. Do not run, play, or make practical jokes in ammunition handling or storage areas at any time. Horseplay is strictly prohibited.

v. Visually examine ordnance handling equipment and weight test data immediately prior to use, during use, and prior to testing for defects. Cease operation of ammunition handling equipment immediately if malfunctioning or undue wear is detected.

w. Position handling equipment to engage the ordnance item so as to stably support the item in the proper, stable attitude at the designated attachment points. In most cases, the proper procedure for attachment of handling equipment or device to an ordnance item or load is specified in ordnance handling documentation; follow these procedures. Fully secure the handling equipment or device to the ordnance item before any attempt is made to move the load. Drive loaded forklift, pallet, and platform trucks forward when transporting cargo up ramps or inclines and in reverse on downgrades. Where this is not possible, insure the load is tilted back as far as necessary to maintain the load level while on the downgrade.

x. Exercise extreme care to avoid impact in handling ammunition; do not drop (even a short distance), do not bump, do not hit one unit against another, do not strike with handling or transportation equipment. Consider any ordnance or ordnance component which has been damaged or is found in an unsatisfactory condition as a result of mishandling, as being defective and dangerous.

y. Ensure that no live rounds accompany shipments of empty cartridge cases and inert articles. Inclusion of live munitions constitutes a shipping and stowage hazard to personnel and equipment. Instructions for return of empty or inert munitions containers under combat or noncombat conditions are as follows:

(1) Under combat conditions, collect all empty brass cartridge cases, tanks, boxes, crates, grommets, waterproof protective caps, and wood blocks after firing and pack and mark for return to the nearest ammunition activity. The commanding officer shall certify in writing to the receiving activity that the material being transferred has been searched and inspected and contains no live rounds.

(2) Under noncombat conditions, when returning munitions containers which are either empty or contain inert components, obliterate the original container markings and remark with either "EMPTY" or "INERT" as appropriate. The markings must also include the originator and the identification of the inspecting, certifying individual who has inspected the container to insure that it is empty or that the contents are inert.

z. When ordnance is being handled in a radiofrequency radiation (RFR)

environment, do not set an item or container on deck against a ship's structure because induced voltages from RFR exposure may dud or initiate the ordnance.

aa. Use weapons elevators and hoists for that purpose only. Never overload a weapon elevator or hoist. Do not operate weapons elevators or hoists if any safety devices or interlocks are inactivated or defective.

C1404. ORDNANCE STOWAGE PRECAUTIONS

a. **Stowage Rules**. Instructions and regulations concerning the stowage of ammunition and explosives aboard ship are set forth in reference C14-1.

b. Keep all magazines and other stowage spaces containing ammunition, explosives, or other dangerous articles clean. Post appropriate warnings and instructions in and near stowage areas. Keep the doors to magazines closed and locked at all times except when actually removing or stowing ordnance.

c. Never perform ordnance repairs in stowage areas.

d. Monitor space temperature and ensure it does not exceed ordnance limits. Guidance for temperatures above 100°F in spaces is provided in reference C14-1.

e. Do not stow electroexplosive devices (EEDs) such as electric primers, detonators, igniters, squibs, and fuzes in the same compartment or within 5 feet of electronic equipment that generates radio frequency energy when operating.

f. Store ordnance in designated storage facilities only.

g. Magazines on board ships are designated to hold a single type of ammunition. Where space limitations are such that separate stowage is impossible or impractical, stow more than one type in accordance with "Chart of Permissible Stowages" as specified in reference C14-1, in 46 CFR 146 (ammunition ships, ships carrying explosives as cargo or amphibious ships) or as otherwise authorized by COMNAVSEASYSCOM. When the stability and compatibility characteristics of any ammunition, explosive, or other dangerous material are unknown, provide separate stowage and request appropriate instructions from COMNAVSEASYSCOM.

h. Protect ordnance and ordnance components, particularly propellants and pyrotechnics, against exposure to moisture. Most ordnance components are stowed in their shipping containers which are hermetically sealed; do not open these containers until their contents are needed for use of assembly.

i. Regardless of the stowage arrangement, properly stack, brace, block, and secure ordnance material to positively restrain it against movement when subjected to ship movements at sea.

j. Do not store materials such as lead azide, lead styphnate, or other substances used to initiate main charge explosives, whether separate or loaded in a detonator, fuze, or firing mechanism, in or near a magazine containing bomb type ammunition. Certain bomb-type ordnance items such as warheads assembled with fuzes or exploders are excepted if they are authorized as items of issue or specific authorization is obtained from COMNAVSEASYSCOM.

k. Do not stow fertilizer grade ammonium nitrate, commercially manufactured explosives or commercially manufactured explosive-containing devices not controlled or owned by the Armed Forces on naval vessels without approval of the Chief of Naval Operations. If authorized for carriage aboard ship, any necessary stowage instructions will be provided by COMNAVSEASYSCOM and arrangement made by that command for the provision of technically trained personnel and/or special escort personnel who may be required.

C1405. ORDNANCE FIRING AND LAUNCHING PRECAUTIONS

a. Do not use live ammunition for drill or training purposes. However, if specifically authorized by the ship's commanding officer and the applicable HERO restrictions are observed, the following types of live ammunition may be used for loading drills aboard aircraft carriers:

(1) Aircraft gun ammunition.

(2) Conventional HE loaded bombs.

(3) Rockets and rocket launchers with installed rockets

(4) Guided missiles w/exercise heads only.

(5) Torpedoes w/exercise heads only.

b. When using live ammunition for loading drills, as specified above, observe all safety precautions specified for that ammunition during the drill. The commanding officer shall notify the task group commander or other appropriate operational commander before conducting a drill in which live ordnance is used.

c. Do not conduct loading with live ammunition or arming drills in any port or harbor unless the ship is at an explosive anchorage.

d. Inspect ordnance before use.

e. Do not assemble or arm ordnance before use.

f. Clear blast areas before detonating ordnance.

g. Do not enter marked danger circles while guns, directors or launchers are being trained.

h. Do not apply ordnance to energized firing circuits.

i. Never attempt to remove "duds" or "misfires" without direct supervision and by knowledge of the weapons officer.

j. Cease firing any ordnance when the line of fire is endangering objects other than the designated target. These objects shall include friendly ships, shores, or aircraft and own ship structure.

k. Danger zones shall be delineated for all shipboard elevator platforms which do not have guardrails or sides protecting the platform edge as follows:

(1) Elevator without ramps from deck level to platform: a painted yellow margin extending from the platform edge inboard 3 inches.

(2) Elevators with ramps from deck level to platform: a painted yellow margin 3 inches wide on the side of the platform and 5 inches wide on the ends of the platform beyond the maximum inboard extension of the ramps.

(3) Elevators with flush deck hatches shall have danger zones painted around the hatch openings. They shall be alternate red and yellow; 4 inches long and 6 inches wide.

l. Missile and Rocket Launching

(1) Never load, train or move a launcher in any direction unless specifically authorized by the officer of the deck. Operate no part of the launch system until all personnel are clear of the system's moving parts. Do not attempt maintenance or repairs to the launching system while it is in operation. A safety observer shall be provided during all movements of a launcher.

(2) Before starting a loading operation, sound the warning horn and bell and evacuate the living spaces beneath the launcher while firing operations are in progress. All personnel shall be clear of the blast area and exhaust path of the missile or rocket at all times.

(3) Before attachment of a missile, rocket, or other electrically-fired device to a launcher, ensure that the firing circuit is not energized. Ensure the missile or rocket is properly assembled and prepared for launching according to applicable operational assembly instructions and standard operating procedures for launching. Adhere to the firing temperature limits specified for each missile or rocket for safe launch operations.

(4) Only a qualified firing officer shall touch any firing switch.

m. Aircraft

(1) Follow the prescribed sequence of steps as outlined in the current loading check list/loading manual to load ordnance on aircraft. Failure to follow the prescribed steps in the order indicated could result in a premature

launch, inadvertent detonation, misfire, dud-fire, or other undesirable and hazardous situations.

(2) Follow the applicable loading checklist sequential steps during aircraft unloading operations. Note that the sequence for unloading operations is not necessarily the reverse order of loading operations and should be so noted on the loading checklist. Handle ordnance on aircraft involved in a crash or fire in accordance with the individual ship's aircraft crash and fire bills, the particular procedure specified for the ordnance involved, and the precautions of reference C14-2.

(3) Avoid denting or rupturing the outer cases of aircraft escape propulsion systems (AEPs) and cartridge-activated devices (CADs). It may result in inadvertent activation of the AEPs or CADs and could cause death or injury to personnel and material damage.

n. Gun Firing Operations

(1) Every type of gun has definite ammunition assemblies designated for use in the gun. Fire only those authorized ammunition assemblies from a particular gun. Observe standard operating procedures for loading and firing guns. Use guns in the manner and for the purpose designed and prescribed by gunnery orders.

(2) In preparing a gun or battery for firing, inspect all gun assembly operating systems (recoil, counterrecoil, and gas ejector systems) to see that they are in satisfactory working condition. Check turret blower and sprinkling systems as well as gun servicing equipment, such as hoists and trays for satisfactory operation.

(3) Conduct tests at various angles of train and elevation to insure that the mechanically-operated firing cutout mechanisms are operating positively to prevent firing when the gun is pointed in a direction that would endanger the ship's structure.

(4) Before firing, remove the gun tompion and verify the bore of the gun to be clear and in satisfactory condition. After each firing of a bag gun, verify the bore to be clear of powder gases or smoldering remnants of the powder bag before loading the gun for another firing.

(5) In loading a non-automatic gun, do not close either the gun ready light switch or the gun firing circuit cutout switch until the breech is fully closed and all personnel are clear of the recoil. As soon as a gun is loaded, close the breech without delay. On nonautomatic breech mechanisms, ensure that the breech plug is latched in the closed position by hand.

(6) Do not unlock or open the breech plug of a gun while there is a live primer in the firing lock. Only open a firing lock into which a live primer has been inserted when it is known that the loaded gun has fired or when the gun firing circuit is interrupted.

(7) Marks or indicators are provided to indicate whether or not the gun returns to the battery. Where possible, detail a member of the gun crew to observe these marks or indicators after each shot. Stop the service of the gun should the gun fail to return to battery.

(8) Before shifting to automatic at the gun, when fully manned, synchronize the elevation and train by matching pointers, using either manual or local control on the mount.

(9) Do not stow a dud or misfired round in a magazine unless specifically authorized by the commanding officer. If magazine stowage is authorized, electrically disarm the dud or misfired round and ensure that all safety devices are installed; remove any pyrotechnic devices.

o. Never point small arms toward anyone unless there is a clear intent to challenge or kill. Protect small arms ammunition from shock which might dent it or fire the primer.

p. Make SAFE any ordnance that has not been expended at the first opportunity in accordance with prescribed instructions for the respective assemblies and return to stowage in the proper magazine. If the ordnance is normally stowed in a container, replace it in its container prior to stowage. Exercise care to ensure that supports and spacers are also replaced in the container. Ensure markings on the ordnance item agree with the markings of the container. Reseal any container which was originally sealed by approved means.

q. Store aircraft parachute flares that have been unpackaged in flare lockers located by outboard sponsons or in segregated areas at flight deck level where they can be jettisoned immediately in case of accidental ignition. Return no Mk 45 paraflares to primary magazines if the shipping containers have been opened (not applicable to the LUU-2).

r. When arriving in port, remove all pyrotechnic items, except pyrotechnic signaling devices for boats and life rafts, from racks, clips, and other open locations and restow them in locked lockers.

s. Suspended Ordnance

(1) Label and segregate unserviceable ordnance for return to an ordnance activity at the earliest opportunity. Certain ordnance which has been declared obsolete by COMNAVSEASYSCOM is also classed as unserviceable; however, COMNAVSEASYSCOM may authorize the use of such obsolete ordnance for specified purposes.

(2) Do not use limited-use ordnance in the unrestricted manner for which it was designed or issued. If a requirement exists, limited-use ordnance may be expended but only as authorized and approved by COMNAVSEASYSCOM. Otherwise, label and segregate limited-use ordnance for return to an ordnance activity at the earliest opportunity.

(3) Do not use suspended ordnance at all but label and segregate for return to an ordnance activity at the earliest opportunity. If, in the meantime, it is reclassified, its reclassified status shall govern its use.

C1406. ORDNANCE ASSEMBLY, TESTING, AND MAINTENANCE PRECAUTIONS

a. Never remove a base fuze from a loaded projectile or rocket head.

b. Never remove a nose fuze which would expose the main explosive charge.

c. Never fuze or defuze white phosphorous loaded projectiles.

d. Never remove cavity liners.

e. Never disassemble a saluting charge.

f. Never make alterations to service, training, or dummy drill ammunition without specific approval from COMNAVSEASYSCOM.

g. Never repair projectiles with loose nose plugs, windshields or fuzes.

h. Never apply "field fix" modifications to ammunition except as approved by COMNAVSEASYSCOM.

i. Never rework complete assemblies of unserviceable ammunition.

j. Never remove filling hole covers from explosive-loaded items for any reason.

k. **High Pressure Considerations**. Ordnance, such as missiles and torpedoes, and ordnance equipment such as guns, catapults, and hoists, utilize high pressure pneumatic and hydraulic systems. The following general precautions apply:

(1) Only personnel who are specifically trained and authorized to perform such work shall charge, maintain, or relieve high pressure systems.

(2) Before applying pneumatic or hydraulic pressure to an ordnance item, check all connections and fittings for leaks and tightness and provide all hoses with safety chains for secondary restraint. Only use the fluid medium specified by the standard operating procedures. Never use a substitute fluid medium unless specifically authorized by COMNAVSEASYSCOM.

(3) Never charge high pressure systems over the prescribed working pressure for the system unless specifically authorized by COMNAVSEASYSCOM. When the prescribed working pressure is for any reason altered, prominently mark or otherwise indicate the new designated pressure on the pressure reservoir component of the system.

(4) Do not strike, cut, loosen, or tighten fittings, lines, and connections of an ordnance system under pressure while the system is pressurized. Use only tools and equipment provided and approved for high pressure system work.

1. To prevent heavy metal poisoning from depleted uranium, never disassemble CIWS 20 mm rounds aboard ship. Wear heavy gloves when handling loose penetrators or target debris.

Chapter C14

REFERENCES

C14-1 OP-4, "Ammunition Afloat"

C14-2 OP-3347, "United States Navy Ordnance Safety Precautions"

CHAPTER C15

MARINE SANITATION DEVICES

(SEWAGE SYSTEMS)

C1501. DISCUSSION

a. All naval vessels have marine sanitation device (MSDs) designed and operated to prevent the overboard discharge of untreated or inadequately treated sewage into navigable waters of the United States or other countries.

b. MSDs either hold raw sewage until it can be discharged overboard or to a pier connection, or treated so that the effluent quality meets established discharge standards.

C1502. SANITARY, HYGIENIC, AND SAFETY PROCEDURES

a. Hygienic Procedures. The following hygienic procedures are applicable to all MSDs (i.e., collection, holding, and transfer (CHT) systems, JERED Vacu-Burn Sewage Treatment System, Koehler-Dayton Recirculating Flush System and the Pall-Trinity Biological Sewage Treatment System):

(1) If connecting or disconnecting sewage transfer hoses, do not subsequently handle potable water hoses without a thorough wash-up (hands, lower arms, and face in that order) with hot soap and water.

(2) Wear rubber gloves, rubber boots, faceshield and coveralls, while connecting or disconnecting sewage hoses.

(3) Do not smoke, eat, or drink prior to a thorough wash-up with hot water and soap after working in sewage spaces or on MSD equipment.

(4) Ensure that personnel exposed to sewage or who work in sewage spaces with MSDs maintain basic immunization current as required by BUMEDINST 6230.1A and NAVMED P-5010-7.

(5) Do not eat, drink, or smoke in MSD spaces.

(6) Make certain that removable drip pans or coamings are installed in health sensitive spaces, such as food storerooms, food preparation or messing areas, sculleries, medical and dental spaces, or berthing spaces, to catch, contain and detect possible leakage from valves or takedown joints.

(7) Ensure that removable drip pans are installed beneath comminutors to detect leakage or prevent leakage from causing an unsanitary condition.

(8) Verify that health warning placards are posted in appropriate locations, identifying procedures to be followed in those areas.

b. **Maintenance Procedures**

(1) Wear acid resistant rubber gloves, rubber boots, faceshields, and coveralls when performing maintenance which requires disassembly of sewage equipment or when contact with sewage is possible.

(2) Wash down the area and components with hot potable water and stock detergent and rinse with sea-water or fresh water upon completion of maintenance.

(3) When MSD maintenance is completed, remove protective clothing and place in two plastic bags, with rubber boots and gloves going in one bag, and with fabric clothing going in a dissolvable bag. This dissolvable bag should be placed in a canvas or nylon laundry bag.

(4) Wash rubber boots and gloves in hot potable water and stock detergent, and rinse with an approved disinfectant solution.

(5) Launder MSD-soiled fabric protective clothing separately. Disinfect facilities upon completion.

(6) Never walk through living, eating, working, or any manned spaces while wearing protective clothing, boots, or gloves that were worn while in MSD spaces.

(7) Thoroughly wash hands, lower arms and face, IN THAT ORDER, with hot water and soap, using the wash-up facilities provided in the area prior to leaving the MSD maintenance area.

c. **Leak or Spill Clean-up Procedures**

(1) In the event spaces become contaminated with sewage as a result of leaks, spills, or sewage system backflow, evacuate the space immediately and notify the executive officer, damage control assistant, and Medical Department of the spill.

(2) Secure the spill area from traffic.

(3) The ship's gas free engineer (GFE) shall test the area to ensure that the atmosphere is within acceptable gas limits.

(4) Use proper respiratory protection (a full facepiece, self-contained breathing apparatus (SCBA) operated in the pressure-demand mode or a full facepiece air-line respirator operated in the pressure demand mode and equipped with an auxiliary self-contained air supply) if the atmosphere is not within acceptable limits.

NOTE

Refer to Chapter B6 for guidance in using the oxygen breathing apparatus (OBA) for respiratory protection in atmospheres immediately dangerous to life or health (IDLH).

(5) Post a safety watch with respiratory protection at the compartment access during clean-up (two man rule).

(6) Spilled sewage shall be removed or washed down.

(7) Keep respiratory protective equipment available even if the atmosphere is within acceptable limits. Emergency escape breathing devices (EEBD) are to be mounted in CHT pump rooms and kept available in MSD work areas for emergency exiting. A minimum of two EEBDs shall be mounted in each pump room.

(8) Ensure proper ventilation is provided, maintained and the area is recertified as gas free at least every 2 hours, (every 1 hour for ambient temperatures above 90°F), or more frequently if deemed necessary, until the clean-up is complete.

(9) Accomplish a final wash down with water and stock detergent.

(10) Treat food service spaces, berthing areas, and medical spaces with an approved disinfectant.

(11) The MDR must certify the space as clean.

d. **Sewage Transfer Operations**

(1) Wash with hot potable water and stock detergent, and rinse with sea water or potable water, all deck discharge connections, components, and immediate areas each time sewage transfer operations are terminated and the sewage hose is disconnected.

(2) Check the deck discharge connection periodically during sewage transfer operations to ensure that the connection is intact and that an unsanitary condition is not developing.

e. **Prevention of Leaks**

(1) Check all MSD components (such as valves, pumps, comminutors, and fitted flanges) for leakage in accordance with applicable PMS. Pump mechanical seals have a zero leakage requirement. Replace the pump mechanical seals if any leakage is detected into the space (past the secondary seal). Also, seal replacement is recommended if pump disassembly is required.

(2) If water is detected in the seal oil cavity but the seal is not leaking into the space, do not replace the seal. Instead, replace the seal oil in accordance with the applicable maintenance requirement card (MRC) and monitor the oil cavity for further leakage.

(3) Check the sump and the alarm system weekly for proper operation. If the high level alarm sounds, it indicates that one or a combination of problems has occurred:

(a) Excessive leakage within the coaming.

(b) Failure of the sump pump or eductor to operate. Immediate action must be taken to identify and correct the problem.

f. **Contaminated Bilges**

(1) Bilges contaminated with sewage wastes shall be pumped out, washed down with a fire hose, and pumped out again.

(2) If potable water tanks form the deck or any boundary of the bilge, daily monitor the bacteriological content of the water from those tanks. Continue monitoring until it is assured that sewage contamination of the tanks has not occurred.

(3) If the potable water system is suspected of being contaminated, secure the appropriate tanks until the water is determined to be safe for consumption.

g. **Sulfamic Acid Cleaning**. (This procedure is normally done by an industrial activity per reference C15-1).

(1) Sulfamic acid may be used to remove hard scale from pipe sections, such as urinal drains, which can be removed and soaked separately.

(2) Wear rubber gloves, air-purifying respirator with acid gas cartridge and mist prefilter, and safety goggles during handling of dry acid or dry neutralizing compounds and mixed solutions.

(3) If cleaning solution comes in contact with the skin, thoroughly wash the affected area with soap and water.

(4) If cleaning solution comes in contact with eyes, the eyes shall be rinsed thoroughly with clean water and medical attention immediately obtained.

(5) Hands and all exposed skin shall be thoroughly washed with soap and water at the conclusion of acid cleaning procedure.

C1503. GAS FREE ENGINEERING FOR MSD SYSTEMS

a. Do not open MSD units,enter a CHT tank or remove a component which will leave an opening to the tank unless inspected and certified by a gas free engineer, industrial hygienist (certified GFE), or National Fire Prevention Agency marine chemist, since toxic and explosive gases may exist in the tank.

WARNING

Ship's force shall not open the manhole or enter a CHT tank at any time unless this is done at a suitable industrial facility. If problems develop preventing CHT operation which require such tank access for correction, divert all drains overboard and secure the CHT system until proper facilities are available.

b. Observe a no smoking regulation. Do not allow open flame, ordinary electric lights, flashlights, regular tools, or sparking electrical apparatus in or near open tank.

c. Recertify (gas free) all tanks at least every 4 hours. It must be recognized that even though a tank may be certified gas free, toxic gases can remain in the sludge blanket and could be released when the blanket is disturbed.

d. Before opening a tank in any manner, or removing any valves or components below the highest level of the tank overflow, wear proper respiratory protective equipment (see paragraph 1502c4 for respiratory protection requirements). A second person shall be on hand to lend assistance as required. A spare respirator must be immediately available.

e. Force-ventilate the tank continuously after opening. Ventilation should be sufficient to provide a change of air in the tank every 3 minutes. Avoid contamination of the air compressor or ventilation intakes.

f. Work can continue outside the tank without respirators once forced ventilation of the tank has commenced.

g. Do not weld or perform hot work inside or outside the tank without a gas free engineer determining that the tank is safe for hot work. After welding is complete, inspect the coating for heat damage and repair as necessary.

C1504. SEWAGE CHT SYSTEM

a. Control of Toxic Gas Hazards. In order to minimize the potential hazards resulting from the release of toxic gases from the CHT system, the following precautions shall be observed:

(1) For tanks larger than 2,000 gallons, ensure that the installed CHT tank aeration system is operated as required by the Sewage Disposal Operational Sequencing System (SDOSS).

(2) Always assume that the CHT tank contains sewage and toxic gases, and (R
has an oxygen deficient atmosphere. Of particular concern is hydrogen sulfide (H_2S), a gas with a rotten egg smell at low concentrations. This odor is not

reliable as a warning signal because H_2S deadens the sense of smell. As H_2S concentration increases, the degree of danger increases.

(3) Never enter the tank or open the manhole access at any time unless at a suitable industrial facility, and only after certification by a gas free engineer, industrial hygienist (certified GFE) or National Fire Protection Association (NFPA) marine chemist.

(4) If hydrogen sulfide is detected by smell when working in the CHT pump room, comminutor space, or any space containing CHT piping, evacuate the space immediately.

R) (5) A space in which the hydrogen sulfide odor has been detected should only be reentered by personnel who have been properly trained and are wearing the proper IDLH respiratory protection equipment. Contact a gas free engineer immediately.

R) (6) Ensure that two EEBDs are installed in each CHT pump room and comminutor space. Ensure sinks, soap dispensers, and paper towels/hand dryers are also installed in each CHT pump room and comminuter space.

(7) To minimize hazards, always flush tanks and pump out twice and ensure gas free if components are to be removed or disassembled outside the tank, or from the piping below the highest point of the CHT tank overflow.

(8) Always recheck gas levels in the tank before reopening the tank or piping to replace repaired components if more than 2 hours have elapsed since the tank was last certified gas free (1 hour if the ambient temperature is above 90°F).

(9) If levels of gases have climbed above acceptable limits, repeat flushing procedure.

(10) Wear proper respiratory protective equipment when replacing co-ponents.

(11) Always flush out sumps and space coamings completely before conducting any maintenance even if hydrogen sulfide levels in a space are at safe levels (10 ppm) or less.

(12) In any space where a sewage spill has occurred, do not conduct any work or maintenance other than work required to clean up the spill, until gas levels are below acceptable limits and all sewage wastes, including solids, have been removed from the space and the space washed down.

(13) Before opening any unventilated void or compartment which contains sewage piping and which has not been inspected or opened for an extended period, personnel should use suitable respiratory protective equipment while opening the space and the atmosphere tested to ensure it meets safety criteria. A spare respirator should be available at the compartment

access prior to commencing work. Post a safety watch before entering a CHT pump room where the installed ventilation system is inoperable.

(14) Work in spaces with hydrogen sulfide levels greater than 10 ppm should be limited to that required to clean up a spill and to gas free the space only, even if personnel are using respirators. If levels below 10 ppm cannot be obtained and maintained, the space should be secured until industrial facilities services are available to provide guidance, training, and technical assistance.

b. **Safety Precautions for CHT Operations**

(1) Whenever a high level alarm sounds on a CHT tank, immediately close the isolation valves on drains below the overboard discharge and divert upper level drains overboard to preclude flooding of spaces.

(2) After completion of sewage transfer hose blowdown or seawater flushing, ensure transfer hose is depressurized. Close deck discharge valves prior to disconnecting sewage hose.

c. **Safety Requirements for CHT Maintenance**

(1) Do not attempt CHT system maintenance until the safety requirements and precautions have been thoroughly read and understood and only use the specific procedures for this maintenance outlined in the Naval Ship's Technical Manual, Chapter 593. If these procedures cannot be followed due to some equipment malfunction, maintenance shall be deferred until a suitable industrial facility/service becomes available. If necessary, deactivate the system and divert drains overboard until such facilities are available.

(2) If maintenance not requiring tank entry calls for equipment to be removed which will leave an opening in the tank, or calls for the removal or disassembly of any valve or piping component in the CHT pump room or anywhere below the highest point of the CHT tank overflow piping, the following safety precautions shall be observed:

(a) Post a safety watch with a spare respirator at the access.

(b) Ensure that the installed ventilation system is operating properly and that the compartment access is open. The ship's gas free engineer shall determine if any additional temporary ventilation is required.

(c) Ensure that the pump room coaming sump or space eductor is operational and that all valves are properly aligned to evacuate the space. All valves in the eductor discharge line, either to the deck connection station (in port) or to the overboard discharge (at sea), must be open. If a valve or piping is being disassembled or removed, ensure that the valve alignment will not permit the eductor to discharge into the space through the

opening in the piping created by the maintenance. Evacuate any contents in the pump room coaming sump.

(d) Flush the tank and piping.

(e) Immediately seal openings using either blank flanges or a suitable sealing device.

(f) Have a gas free engineer recheck the tank atmosphere using a proper respirator before replacing failed components if more than 2 hours have elapsed since the tank was last certified gas free (1 hour if ambient temperature is above 90°F). If levels have climbed above acceptable limits, repeat flushing procedure until acceptable levels are obtained. Equipment or components can then be replaced using proper respirators.

(g) Wash down the area with hot potable water and stock detergent.

WARNING

NEVER assume a tank is empty or is not dangerous because the tank has not been in use or because drains have been diverted overboard. Sewage can unintentionally collect in the tank due to faulty or misaligned valves.

(3) Do not conduct maintenance (including pump maintenance) on a CHT system if both pumps are inoperable until suitable industrial facilities and personnel are available.

Chapter C15

REFERENCES

C15-1 Naval Ships' Technical Manual, Chapter 593 (NAVSEA S9086-T8-STM-000/CW 593R, Pollution Control).

CHAPTER C16

HEAVY WEATHER

C1601. DISCUSSION

a. Heavy weather is any weather condition that results in high winds, extreme sea states, and heavy rain, snow and/or hail. Obviously, weather of this type results in extremely uncomfortable conditions on board ship. Excessive rolls, yaws, pitches, coupled with taking on water make work and living dangerous.

b. There are a multitude of hazards that occur in heavy weather. Objects can slide or fall on personnel, causing injury. Personnel can fall into machinery or equipment. Personnel working exposed to the weather can be washed overboard or against fixed objects. Heavy weather is as dangerous now as it was during the days of sail, and all personnel must be aware of potential hazards and safety requirements.

C1602. LIFELINES

a. Keep lifelines or rails rigged at all times along all boundaries. Keep permanent lifelines in good repair.

b. Keep unguarded openings adjacent liferail or lifeline sections or an end section and adjacent structures to a minimum and in no case greater than 5 inches.

c. Wherever lifelines or liferails and safety nets are installed adjacent to one another, ensure that a safety net overlaps the area protected by lifelines or liferails by a minimum of 3 feet or the space between the lowered safety net frames and the lifelines or liferails is fitted with a section of safety netting.

d. Keep clear of the lifelines when maneuvering alongside a dock or during drills.

e. Use portable single lifelines. These lines shall be set up along one side of walkways in traffic areas of weather decks which are subject to green seas or areas which are not provided with lifelines, grab rails, or equivalent means of safety within reasonable accessibility of the walkways.

f. Ensure lifeline netting (snaking) or lifelines five high are installed along the weather decks of ships subject to green water from heavy seas. Heat missile blast areas shall be rigged with corrosion resistant steel (CRES) or KEVLAR® lifelines or nets.

g. DO NOT dismantle any lifeline on the ship without specific permission of the officer of the deck and then only if temporary lifelines are rigged before dismantling.

h. Inspect lifelines daily for proper installation and material condition. Report any unsafe conditions to the immediate supervisor and correct immediately.

i. Keep weather decks which are subject to seas, clear of personnel except those required for urgent duties. Pass word to this affect during heavy weather. Include such information in the Plan of the Day. Publicize locations where entry is forbidden.

C1603. TIE-DOWNS

a. Use tie-downs or lashing to secure moveable shipboard items, such as aircraft, vehicles and cargo, against the motion of the ship and exposed areas against the forces of wind and waves.

b. Seize or tie-down shackles, hooks, turnbuckles, release devices to prevent working loose. Check them for security more frequently in heavy weather.

C1604. SAFETY PRECAUTIONS UNDER HEAVY WEATHER CONDITIONS

a. **General**

(1) Be aware of stowage locations of all equipment necessary for rigging heavy weather lifelines.

(2) Inspect tie-down equipment such as cables, turnbuckles, deck pads and bolts, at frequent intervals to ensure their security.

(3) Only use the fittings provided on the aircraft, vehicle, and equipment to be transported to secure the item to the ship.

(4) Do not use excessive force to place a tie-down onto a fitting.

(5) Ensure that the arrangement of individual tie-down assemblies are in strict conformance with design requirements.

(6) Ensure that when lashing and tie-down equipment is not in use, it is stowed in its proper location.

b. **At Sea**

(1) Secure all booms, brace skids as necessary, secure all cargo, stow and lash down all movable equipment and covers. Rig in ready life boats

and gripe down, and add heavy weather gripes to these and other types of boats.

(2) Close all unnecessary topside hatches and access openings and be prepared to close off ventilation openings.

(3) Station anchor detail if ship is in dangerous waters.

(4) Inspect all lifelines and rig additional lines as required for topside safety.

(5) At all times, wear a standard Navy safety harness which shall be attached to the lifeline by means of the "D" rings provided on the belt. An inherently buoyant life jacket shall be worn over the safety harness. Safety helmets with chin straps secured shall also be worn.

(6) Use a minimum of two people when required for a weather deck detail and send them out only when necessary.

(7) Remain below decks unless required to be topside to perform essential duties.

(8) Do not go topside without permission of the officer of the deck.

c. **At Anchor**

(1) Hoist in all boats.

(2) Check ship for loose gear, proper lashings, or movable equipment and covers.

(3) Secure the accomodation ladder.

(4) Close all unnecessary topside access openings, and set material condition YOKE to insure maximum watertight integrity below the water line.

(5) Station anchor watch.

(6) Be prepared to veer chain or put out another anchor if available.

(7) Keep detachable link in position so that anchor may be slipped if necessary. Have detachable link tool kit available.

d. **Moored to a Pier or Ship**

(1) Place an anchor under foot.

(2) Stow all loose gear and properly lash down all movable equipment and covers.

(3) Close all unnecessary topside openings.

(4) Check all mooring lines and remove the slack to keep the movement of the ship to a minimum.

(5) Lines tending in the same direction should be made to take the strain simultaneously. When slacking lines, attempt to slack all lines taking a strain at the same time in order to prevent a line from taking undue strain and parting.

(6) Be prepared to put out additional lines or wires.

(7) Place fenders along the hull at frame locations (fenders located on shell plating between frames will not protect sides from damage).

(8) Be prepared to get underway.

CHAPTER C17

ABANDONING SHIP

C1701. SAFETY PRECAUTIONS DURING ABANDONING SHIP

a. Wear a full set of clothing including shoes and a soft cap or head covering as protection from exposure.

b. Do not wear a steel helmet when going over the side.

c. Inherently buoyant type life jackets shall be securely fastened. When distance to the water is over 30 feet and/or there is burning oil on the water, throw the life jacket over the side. Inflatable life jackets shall not be inflated until the wearer is in the water. The life jacket shall be inflated as soon as wearer is in the water and/or clear of flames.

d. Go over the sides by means of a line, ladder, or debarkation net if time permits.

e. Look first to be sure that water below is clear of personnel or floating gear or wreckage, if it is necessary to jump.

f. Do not dive, always jump feet first.

g. Always abandon ship as far away from the damage as possible.

h. Know direction of the wind and go to windward side of ship, if possible, to avoid flames, oil, and drift of ship.

i. When in water, concentrate on staying calm and avoiding panic. Obey the following rules:

(1) Conserve energy by moving as little as possible.

(2) Keep clear of oil slicks if possible. If possible, protect eyes and breathing passages by keeping head high or swimming underwater. If swimming underwater, prior to coming the surface, put hands above head and splash the water surface to disperse oil, debris or flames.

(3) If there is danger of underwater explosion, float or swim on the back as near the surface of the water as possible.

(4) Stay with other persons in the water to reduce danger of sharks and (R
make rescue easier. In cold water, forming close circles with others will preserve heat.

(5) If ship is sinking rapidly, swim clear promptly, and tow injured persons clear, to avoid suction effect.

CHAPTER C18

PAINTING AND PRESERVATION

C1801. DISCUSSION

a. Most paints, varnishes, lacquers, cleaners, solvents, and other finishing materials contain flammable solvents and, therefore, present a fire hazard. In addition, these same products frequently give off toxic vapors which are harmful. Chipping causes scale to be dislodged, presenting possibility of eye or facial injury. It is therefore necessary that proper precautions be taken in handling and using these products. See Naval Ships Technical Manual, Chapter 631, Painting and Preservation of Ships for detailed procedures and precautions.

b. Paint removal operations have been shown to produce extremely high (A
personnel exposures to substances found in paints. Administrative and protective measures need to be followed to lessen the amount of dust from sanding, grinding, and chipping of surfaces coated with lead or chromate based paints and from fumes generated during hot work.

C1802. SAFETY PRECAUTIONS FOR SURFACE PREPARATION AND PAINTING OPERATIONS (R

a. Wear safety goggles or full faceshield and long sleeve shirt with sleeves rolled down and all buttons buttoned at all times while chipping or operating power brushes, chipping, or scaling tools. Particulate air-purifying respirators shall be worn for all chipping, scaling, and sanding operations, except if the paint being removed is known or suspected of containing lead. If lead-based paint is to be removed, an industrial hygienist should evaluate the operation and recommend proper respiratory protection and other personal protective clothing. See Chapter B10.

b. Do not paint in any area where welding or other hot work is being performed.

c. Do not use electric wire brushes and chipping tools over the side.

d. Wear supplied air respirators when engaged in spray painting opera (R
tions internal to the ship or in confined external areas (e.g., cabin of small boat). A supplied air respirator may be required for extensive external spray painting operations. For minor external spray painting and touchup of small areas by spray can, an organic vapor respirator, either cartridge type or disposable, with a paint mist pre-filter may be used.

e. When working over the side or aloft, see Chapter C8 of this manual for additional precautions.

f. Paint should be returned to paint locker at end of day. (R

R) g. Store paint, brushes, and stirring sticks in closed metal containers. Do not store paint and paint wastes on the pier for extended periods of time.

h. Do not smoke when painting. Post "NO SMOKING" signs in the area(s) being painted. If painting with vinyl, saran, or other explosive or toxic vapor paints, the following additional precautions shall be followed:

(1) Fly the BRAVO flag, if in port.

(2) No smoking shall be permitted on board, topside, or below decks.

(3) No smoking or hot work shall be permitted within 50 feet of the ship. Signs shall be posted on the pier "DANGER-SPRAYING WITH VINYL".

(4) Adjacent ships shall be notified.

(5) Take precautions to prevent vapor pocketing in low points. Shut and dog hatches.

(6) Painters shall be supervised by a petty officer.

(7) Organic vapor cartridge respirators shall be worn by all personnel within 15 feet of vinyl painting or mixing operations.

(8) Painters shall have no spark producing materials on their persons.

(9) Spray guns shall be grounded.

i. Provide ventilation in closed areas when painting.

j. Wear rubber gloves when handling cleaning compounds, thinners, paints, removers, or other irritants.

k. De-energize all equipment in areas being painted.

l. Use a spray booth when spray painting, if available and practical.

m. Explosion proof lighting must be provided during spray painting operations.

n. Return all paints and thinners to the paint locker upon completion of the job, at the end of the workday, or when taking a lengthy break.

o. Wear rubber insulating gloves when using portable, electric-powered tools. See Chapter C9 of this manual for additional precautions when using electrical power tools.

p. Many paints, paint cleaners, solvents and brush cleaners are hazardous materials. Refer to Chapter C23 of this manual for hazardous material storage, use, and disposal procedures.

q. Many paint removal tools are noise hazardous equipment. If so labeled, ensure that proper hearing protective equipment is worn. See Chapter B4 of this manual for additional information.

r. Paint mixing shall be performed in the paint locker if adequately (R
ventilated. If not, mixing shall be done on the weather decks. Posted barricades shall be provided to ensure there is no smoking, open flame, or hot work in the vicinity of the paint mixing area.

s. Personnel with a history of chronic skin disease, allergies, or asthma (R
shall not be permitted to work with paint compounds or thinners. Personnel who are sensitive to paint compounds and thinners shall be reported to the medical department. All personnel who are regularly involved in painting shall be medically screened for ability to wear respiratory protection and any physical condition which might preclude work with paints, solvents or strippers. Follow the requirements of chapter B6 with regard to medical surveillance programs and user certification.

t. No food or drink shall be allowed in the paint area. When painting materials are handled, care shall be taken to wash hands prior to eating, drinking, smoking, or using the head.

u. When painting engineering spaces, they should be in a cold-iron condition before and during paint application. Heat-producing work areas adjacent to where brush/roller application of paint is being performed may be permitted, provided that:

(1) The painting operation involves only minor (touchup) operations.

(2) The painting and hot work operations are separated by a watertight bulkhead.

v. NSTM Chapter 631 provides airless spraying equipment safety precautions. See Chapter C13 of this manual for precautions when using compressed air.

C1803. SAFETY PRECAUTIONS FOR PAINT REMOVAL (A

a. Shipboard paint removal by ship's force shall not be performed for cosmetic reasons or due to excessive thickness.

b. Shipboard paint removal by ship's force should only be done when required to accomplish preservation of corroded surfaces, incidental to hot work, welding, or when bare metal is necessary for an inspection.

c. Mechanical grinding and sanding shall be kept to the absolute minimum with primary reliance on impact tools and authorized chemical paint strippers for paint removal.

d. Assume all paint contains substances, such as lead and chromate, which are hazardous to health if ingested or inhaled in small amounts, unless proven otherwise by sample analysis (see Chapter B10 for sample analysis procedures).

e. Personal protective equipment (PPE) contained in AEL 2-330024045, asbestos rip-out kit, may be used for paint removal operations, provided an inventory is maintained.

f. Ensure that all personnel involved in paint removal wear disposable coveralls, gloves, and other PPE as required.

g. Follow the requirements of Chapter B6 regarding the use and care of respirators.

h. Lead or chromate contaminated paint debris shall be treated as hazardous material and controlled and disposed of accordingly. Topside, set up barriers to prevent paint entry into surrounding waters.

i. Secure and cover all deck drains and installed ventilation systems and openings in the paint removal work area. Isolate the work area to the maximum extent possible with drop cloths and/or plastic.

j. At the end of the work shift personnel shall vacuum debris and all surfaces in the area with a high efficiency particulate air (HEPA) filter vacuum. Coveralls and gloves shall be vacuumed prior to removal.

k. Personnel shall minimize the use of water in the paint removal process, since any used in the operation must be treated as hazardous material.

l. Ensure that paint debris, HEPA filters, and wipe down rags are separated from coveralls, gloves, and other disposable materials. Place them into plastic bags and label both groups as hazardous materials.

m. Tools and surfaces in the work area shall be wiped down after completion of the task.

CHAPTER C19

FOOD PREPARATION AND SERVING FACILITIES

C1901. DISCUSSION

A basic necessity for any ship is a galley. The crew must be fed and personnel must prepare food for consumption. The massive food preparation required to feed a large body of people means that machinery and equipment must be used. The use of this machinery introduces hazards unique to the galley and food preparation areas.

C1902. GENERAL PRECAUTIONS

Before attempting to operate machinery, observe the following general precautions:

a. Check for and determine the location of emergency equipment, such as fire extinguishers and first aid boxes, to ensure their availability should an accident occur. Report any deficiencies or malfunctioning equipment to the supervisor.

b. Make sure that the area around the equipment is clear of obstructions and thoroughly dry. Clean up all spills immediately to ensure a clean, dry, non-slippery working surface.

c. Ensure that the working area has ample lighting.

d. Observe and follow posted operating instructions and safety precautions.

e. If there is any doubt about operating procedures or safety precautions, report to your supervisor.

f. Unauthorized personnel shall not attempt to operate equipment.

g. Be certain no loose gear is in the vicinity of moving parts of machines. Prior to starting, make sure that all safety guards, screens, and devices are in place.

h. When operating a machine, maintain a safe distance from all moving parts. Never use your hands or body to stop moving blades and parts even though power has been turned off.

i. Never lean against a machine while it is operating.

j. If ship movement is severe, exercise caution in operating machines; if severe movement continues, discontinue nonessential machine operation and turn off equipment.

k. Utilize safety equipment such as protective gloves, safety glasses, and dip baskets while handling chemicals or hot water.

l. Keep your hands, body, and clothing away from operating machine parts.

m. Never leave operating machinery unattended.

n. Do not distract the attention of personnel who are operating machines.

o. Do not attempt to clean or service a machine while it is in operation. Before cleaning, adjusting, oiling or greasing equipment, be sure power is turned off and equipment is DANGER tagged.

p. Ensure that all repairs and servicing are made only by authorized personnel.

q. Make sure safety devices such as safety interlocks on galley equipment, such as the covers of vegetable peelers and bread slicer, are maintained in proper working condition at all times. If removed for any reason, such devices must be replaced before the machine is returned to operation.

r. Remove rings and watches, and eliminate any loose clothing such as rolled-up sleeve cuffs, oversized gloves, and ill-fitting coats and jackets.

s. Ensure that permanently-mounted equipment is hardwired (extension cords are not permitted).

C1903. <u>COOKING UTENSILS</u>

a. Make certain that all heavy items, knives, and other sharp tools are securely fastened and stowed in racks to prevent injury to personnel.

b. Secure all coffee pots and urns to prevent dislodging and splashing.

c. Exercise extreme caution and care when handling hot oils, water, and other liquids or when operating steam valves and equipment. In heavy or moderate sea states, do not transfer hot liquids.

d. Never leave drawers, doors, or access panels open where they could become hazardous to personnel.

e. Never leave hot plates, pots, griddles, or fryers unattended.

f. Be careful not to place meat, vegetables, or other foods on a knife or other sharp instrument. The food may conceal the cutting edge.

g. Do not place knives in the wash water until ready to wash them. Lay them in plain view beside the sink.

h. When using a cleaver, keep your free hand as far from the path of the cleaver as is necessary to assure safety.

i. Use a metal glove when boning meat.

j. Use a scoop or perforated serving spoon to handle shrimp.

k. Keep the surfaces of meat blocks level.

l. Store utensils in their proper places.

m. Do not allow the handles of cooking utensils to extend beyond the edge of the range. They can be bumped and serious burns to personnel result from spilled food or liquid.

n. Before removing foods from hot ranges and ovens, be sure there is a clear place on which to set them.

o. Use only the proper implements for opening cans and other containers.

p. Hold knives firmly. This cannot be done if the handles are wet or greasy.

q. Keep knives in a rack designated for this purpose only.

r. Magnetic knife racks are prohibited due to knife magnetism picking up foreign material.

s. Keep knives sharp at all times.

t. Ensure hot pads are clean and dry.

u. Keep all tools clean and dry.

v. Never carry a knife while carrying another object.

C1904. **FOOD PREPARATION**

a. Observe personal cleanliness at all times.

b. Keep your hands clean.

c. Keep fingernails short.

d. Wear appropriate hair covering at all times in food handling areas.

e. Do not touch food with your hands unless necessary. Use appropriate implements for handling food when possible.

161-521 O - 94 - 6

f. Never handle food when you have an infection of any kind on your hands or arms. If you develop a sore throat, cold, intestinal disturbance, or symptoms of other general disease, report to your supervisor at once.

g. Avoid food spillage wherever possible. Cleanup spilled food immediately to prevent a slippage hazard and for cleanliness.

h. Do not use leftovers held over 36 hours.

i. Ensure that distant-reading dial thermometers and, when required, electronic temperature monitoring units are installed and operating. The interior-push release arrangement and safety-release mechanism required in "walk-in" refrigerators should be installed and properly operating.

j. Discard protein foods that have remained at room temperature longer than 3 hours.

k. Observe safety precautions around all electrical equipment to avoid injury from shock.

C1905. SAFE OPERATION OF EQUIPMENT

a. **Deep Fat Fryer**

(1) Beware, this is high voltage equipment.

R) (2) Extinguish a fire in the deep fat fryer per NSTM 555.

(3) Never leave fryer unattended when in use.

(4) Do not allow large pieces to drop on heating units or thermostat bulb if solid fat is used.

(5) If possible, melt solid fat prior to putting into deep fat fryer.

(6) Ensure heating coils are completely covered with fat before turning on.

(7) Never exceed the maximum temperature noted by manufacturer.

(8) Monitor deep fat fryer at all times when unit is turned on for pre-heat and frying mode. A deep fat fryer thermometer should be used to monitor temperatures.

(9) Install cover when fryer is not in use.

(10) Secure deep fat fryer following posted instructions when not in use.

(11) Ensure that grease on the deck in front of the deep fat fryer is cleaned up as it occurs. The accumulations of oils and grease on the deck create a significant slip hazard.

b. **Dough Mixing Machine**

(1) Never attempt to cut dough while the agitator is revolving.

(2) Never attempt to knead or feel consistency of dough product while machine is in operation.

(3) Never attempt to clean out a bowl in the tilt position by reaching in unit while the agitator is revolving.

(4) Check safety switch to lid cover for proper functioning in accordance with PMS.

c. **Food Mixing Machine**

(1) Use proper machine speed for the specific operation.

(2) Never place hands into the bowl while machine is in operation.

d. **Vegetable Cutting and Slicing Machine**

(1) Always use plunger when applying pressure on vegetables being fed into the hopper.

(2) Do not use loose fitting gloves when operating the machine.

e. **Meat Slicing Machine**

(1) Never operate machine unless the guard for the rotating slicing blade is secured in place.

(2) Do not use hands to press down food.

(3) Never touch the blade when it is running or exposed for slicing.

(4) Set index at zero and secure power at the machine and distribution box when cleaning blade.

(5) Ensure slicing machines are provided with a toggle switch guard.

(6) Always disconnect power cord prior to cleaning and reconnect only when ready to use.

(7) Clean the blade with a clean, detergent soaked cloth wrapped around a cook's fork or other extension utensil.

(8) Reassemble machine after cleaning.

f. **Bread Slicing Machine**. Keep hands away from knives when machine is in operation.

g. **Steam Kettle**

(1) Each day this equipment is used, test the safety relief valve while under operating pressure by pulling the chain attached to the safety-relief valve arm.

(2) Do not tamper with the safety valve or tie it closed. It is there to prevent the kettle from exploding.

(3) Do not apply steam to an empty kettle; never put water into a hot, dry kettle.

(4) Ensure safety-relief valve arms are equipped with an 18-inch chain to allow activation from a safe distance. Chains must be mounted in such a way that the need to reach over or between/behind hot kettles is eliminated.

(5) Ensure steam jacketed kettles are hydrostatically tested as required by the equipment Maintenance Requirement Card (MRC).

h. **Electric Griddle**

(1) Keep griddle turned off when not in use.

(2) Keep cooking surface and grease gutter scraped and wiped clean at all times.

(3) Remove, empty, and clean grease drawer after each use.

(4) Use griddle guard as necessary to keep food from sliding off the cooking surface.

(5) Never use water to clean a griddle.

i. **Coffee Urn**

(1) Do not introduce water too quickly into boiler.

(2) Do not overfill boiler. Be sure water has stopped rising in the gage glass after the water inlet valve is closed. Do not turn on activating switch until water-level gage reads full or the pressure-control dial reads 36 ounces. Never turn on activating switch while urn cover is open.

(3) Do not open urn cover while siphon valve is open. Do not agitate coffee while cover is open. Do not remove leacher from urn body until it is completely drained.

(4) Do not obstruct safety valve outlet. Keep equipment clean. Clean the urn immediately after use to prevent development of rancid taste.

j. **Ranges and Ovens**

(1) Do not allow grease to collect in oven.

(2) Do not clean oven while it is hot.

(3) Clean oven thoroughly once a week in addition to normal daily cleaning.

(4) Turn off surface units when not in use.

(5) Keep range drip pan and grease trough clean. Never allow grease to accumulate since it is a serious fire hazard.

(6) Observe the electrical wiring under the range griddle/hot plate to see if wiring is secured in place and not chafed or in grease drip-pan.

k. **Meat Chopping Machine**

(1) Do not feed by hand. Use hard rubber pestles (stomper) provided with equipment to feed product through a machine.

(2) Do not attempt to remove anything from the machine while the machine is running.

(3) Disconnect the machine before cleaning.

l. **Meat Tenderizing Machine**

(1) Do not place hands too near the feed slot when feeding material into the machine.

(2) Do not use loose-fitting gloves when operating machine.

m. **Steam Proofer**

(1) Only authorized personnel are permitted to operate this equipment.

(2) Clean the proofer after each use to avoid development of bacteria.

n. **Dish Washing Machine**. Observe operating instructions and safety precautions concerning sanitary procedures to prevent health hazards.

o. **Steam Table**

(1) Use the proper implements, such as pot holders and tongs, for handling the containers.

(2) Tilt containers away from you when inserting them into the wells.

(3) Carry hot liquids in covered containers with the covers securely in place.

(4) Immediately mop up grease which is spilled on the floor. Greasy floors are doubly hazardous. They can cause fires as well as falls.

p. **Potato Peeler**

(1) Never operate the peeler unless water has been properly applied.

(2) Do not put your hand in the machine while the machine is running.

q. **Garbage Grinder**

(1) Do not put hands into grinder when in operation.

(2) Machine must be started and water flowing before waste is fed in.

(3) Feed food waste gradually.

(4) Do not feed metal, wood, cloth, rubber, plastics, or corn husks. If fed accidentally, stop grinder immediately and remove object after having disconnected power. Bones larger than 1/4 inch in diameter for 400-pound/hour grinder or 1 inch in diameter for 1,600-pound/hour model should not be put into the grinder.

r. **Gaylord Exhaust Hoods**

(1) Prevent water or other cleaning fluids from entering the fire control box and causing an electrical short circuit since the fire control box contains a live electrical circuit.

(2) The baffle blades and interior of hood should be cleaned at least once a day to prevent fires from accumulation of grease.

(3) During the cleaning process care shall be exercised to prevent splashing which could cause serious burns to the cleaning operator.

(4) Keep hood drains clear at all times.

CHAPTER C20

LAUNDRIES, DRY CLEANING PLANTS AND PHOTOGRAPHY

C2001. DISCUSSION

Hazards in laundries, dry cleaning plants, and photographic laboratories include mechanical equipment, toxic chemicals, electric power, and heat. Safety precautions contained in this chapter are basic and general.

C2002. PRECAUTIONS RELATING TO LAUNDRY AND DRY CLEANING EQUIPMENT

All laundry and dry cleaning plant personnel should be PQS qualified (Ship board Laundry Equipments NAVEDTRA 43448). (A

a. Washer Extractor

(1) Thoroughly examine all clothes before cleaning; remove all foreign materials such as matches, ink pens, and metallic objects.

(2) Make certain that each cylinder door is firmly latched before operating the machine.

(3) Do not exceed the prescribed loading capacity of the cylinder; doing so may damage the machine or prove hazardous to personnel.

(4) Be sure the machine is entirely disconnected from the circuit before cleaning or servicing. Use safety tag-out procedures as required by PMS and the tag-out program.

(5) Make sure safety devices, such as the safety interlock on cover, are maintained in proper working condition at all times. If removed or out of order for any reason, replace safety devices before the machine is put into operation.

(6) Never thrust hand into extractor while it is in operation.

(7) Do not exceed the recommended detergent amount for load size being washed. Excessive soap may cause skin irritation. (A

(8) Ensure safety precautions and operating procedures are posted. (A

b. Tumbler Dryer

(1) Turn off power prior to loading and unloading machine.

(2) Never overload the machine.

(3) Never open the door while the tumbler is in motion.

(4) Before servicing or cleaning, be sure the power to the tumbler dryer is entirely disconnected. Use safety tag-out procedures as required by PMS and the tag-out program.

(5) Safety devices shall be maintained in proper working order at all times. If removed for any reason, they shall be replaced before machine is put into motion.

(6) Ensure that the primary lint screen is cleaned after every drying cycle and secondary lint filter is cleaned every 4 hours of operation. Do not operate dryer above 160 degrees F.

A) (7) Ensure safety and fire prevention precautions and operating procedures are posted.

c. **Cabinet Bosom Body Yoke Press**. Make sure air regulator remains in the prescribed preset position.

d. **Dry Cleaning Press**

R) (1) Never operate press with a defective push button or if press will close using one push button.

(2) Do not bypass or leave permanently open push button operated valves.

(3) Shut off air and steam valves and bleed down systems before attempting any repair or adjustment. Use safety tag-out procedures as required by PMS and the tag-out program.

e. **Dry Cleaning Machine**

(1) Thoroughly search all clothes before cleaning and remove all foreign materials such as matches, ink pens, and metallic objects.

(2) Do not exceed prescribed capacity for machine.

(3) Use only dry cleaning solvent that is approved for shipboard use.

f. **Laundry Press**

(1) Never operate the press if either push button is sticking or if press will close using one push button.

(2) Never plug a push button with any device in order to increase speed.

(3) Always shut off the air and steam valves and bleed down systems before attempting any repair or adjustment.

(4) Do not allow anyone to stand near enough to the press to receive steam burns.

(5) Do not place hands on the buck while the steam is being applied or while the head is being lowered.

(6) Never bring the head down on the buck while trying to smooth out garments.

(7) Release the head when the press is not in use.

(8) Know the location of the main steam valves. In an emergency, close these valves.

(9) Adjust and perform hydrostatic tests on presses per PMS. (A

C2003. PRECAUTIONS FOR SOLVENTS AND CLEANERS

a. Exposure of the skin to solvents can cause skin lesions and drying. Wear solvent resistant gloves if involved in operations requiring frequent or prolonged contact with solvents.

b. Dry cleaning solvents also release organic vapors which may be toxic in high concentrations and may displace oxygen. Ensure space is adequately ventilated and eye protection is worn. For small spills, a disposable organic vapor respirator should be available in the dry cleaning plant. In the event of a major leak, personnel should evacuate the area and enter only if equipped with supplied air respirators.

c. Only stock 1 week's supply of solvents/cleaners used for spot cleaning in a work space.

C2004. BLEACHES

a. Protect eyes from bleaches.

b. Use only the 15 percent available bleach (chlorine). The 70 percent concentration of available bleach (calcium hypochlorite) is prohibited for use in laundries.

c. Stow only the amount of bleach in the laundry necessary to satisfy daily operational needs. When exposed to high heat and humidity, organic chlorine bleach emits chlorine gas which is hazardous to health; stow this material as far from sources of heat and moisture as possible. Balance of stock should be stowed in dry areas cited on the label.

d. See Chapter C23 of this manual for additional precautions.

C2005. PRECAUTIONS FOR LITHOGRAPHIC, PHOTOGRAPHIC AND RADIOGRAPHIC DARKROOMS AND LABORATORIES

a. Maintain high standards of personal hygiene.

b. Ensure a fast-flow hand and face washer is provided and used in all chemical mixing areas. For eye wash requirements, see eye wash data in Chapter B5.

c. Avoid skin contact with chemicals.

d. Carry out meticulous housekeeping policies in all chemical mixing areas.

e. Make acid-type hand cleaners available in chemical mixing and chemical handling areas.

f. Provide applicable respirators (for qualified users) in all chemical mixing areas to protect personnel from harmful chemical vapors, mists, or dusts. Respirators to be used shall be determined following respiratory program guidelines (see Chapter B6).

g. Use print tongs, clips, hangers, and stirring rods instead of fingers, or wear rubber gloves when handling films and papers in solution.

h. Familiarize yourself with the hazards of E-6 and EA-5 chemistries.

i. Understand the chemical hazards and precautions associated with EH-38, EH-73, and Royal Print Processors.

j. Clean rubber gloves, personal clothing, and respirators at frequent intervals.

k. Properly store photographic chemicals.

l. Provide separate storage areas for chemicals which react violently with each other.

m. Provide darkrooms and chemical mixing areas with ventilation systems (a six-minute rate of change for room air in darkrooms). Some specific developers require local exhaust.

n. Learn the darkroom layout with white lights on.

o. Take care when entering or leaving the area because of the rapid change of lighting and the temporary blindness this causes.

p. Inspect all electrical connections frequently for damage and fraying. Ensure that all electrical equipment is properly grounded, has been safety checked, and approved electrical plugs are used.

q. Never touch an electrical plug, switch, or any part of an electrically operated machine with wet hands or while standing on a wet deck.

r. Use rubber mats with appropriate electrical ratings around equipment that could cause electrical shock.

s. The photographic chemicals, 1,1,2 Trichloroethane and 1,2,2 Trifluoroethane, shall not be used.

t. **Flash Equipment**

(1) Severe electrical shock is the hazard to guard against when using electronic flash equipment. Stored energy in photographic electronic flash units can be lethal (some units operate from voltages as high as 4,000 volts). Use caution whenever operating this equipment.

(2) Repair of electronic flash equipment shall be done only by those thoroughly familiar with the equipment. The storage capacitors may have a large charge at high voltage and can be discharged at high amperage which may be lethal.

(3) Use extreme caution when utilizing flash equipment on the flight deck during launch, recovery, or taxi evolutions especially at night. At no time use flash equipment without the expressed approval of the flight deck officer.

CHAPTER C21

MEDICAL AND DENTAL FACILITIES

C2101. DISCUSSION

This chapter contains basic safety precautions that must be observed to protect medical and dental personnel and their patients from harm. Operating manuals and Planned Maintenance System (PMS) Maintenance Requirement Cards (MRC) should be consulted for complete safety precautions related to specific items of equipment.

C2102. SAFETY PRECAUTIONS FOR MEDICAL FACILITIES

a. **Patient Safety**

(1) Make sure an oxygen breathing apparatus is always available in sickbay for use by corpsmen in evacuating disabled patients or for use with patients who have respiratory impairments.

(2) Heat lamps are a potential source of burns if the patient is over-exposed. Strictly observe all instructions regarding the proper use and safety precautions involved in using heat lamps. This also applies to cautery units.

(3) Ensure measures for responding to anaphylactic shock are immediately available for use when immunizations are given.

(4) Thoroughly indoctrinate all patients in the ship's ward as to available escape routes.

(5) Keep escape routes to sick bay clear of obstructions at all times so that undue manipulation of stretchers is unnecessary.

b. **Special Precautions**

(1) Disposable needles and syringes should be disposed in "sharps" containers as an entire unit. (R

(2) Keep all liquid pesticides under lock and key. Keep bulk amounts in a flammable liquid storeroom.

(3) Ensure that only Medical Department personnel who are instructed in the proper use and toxicity of the pesticides use them.

(4) Keep all poisons and bulk compounding materials under lock and key.

(5) Double lock the pharmacy when not in use, with keys made available only to authorized personnel.

(6) Do not stow, use, or dispense methyl alcohol in the pharmacy.

(7) Account for methyl alcohol in same manner as ethyl alcohol and narcotics. Attach a prominent label to each container of methyl alcohol with clear warning of its dangerous qualities.

(8) Maintain a poison antidote locker. Secure the locker with a seal and ensure a complete inventory is made whenever the seal is broken and antidotes removed.

(9) Stow inorganic medical acids such as hydrochloric, sulfuric, nitric and phosphoric in lead-lined containers in the medical storeroom (see paragraph C2306c3). Stow organic acids such as glacial acetic, oxalic, carbolic, cresylic, and picric acids in a locker lined in acid resistant material (not lead) in the flammable liquids storeroom (see paragraph C2306d).

D) (10) Only keep a minimum working stock of flammable materials (e.g., alcohol and acetone) on hand in Medical Department spaces. Keep stocks of a bulk nature in a separate locked cabinet in the flammable liquid storeroom.

(11) Ensure only Medical Department personnel handle bacteriological specimens.

(12) Due to a large number of extremely hazardous shipboard jobs requiring full attention at all times, label all medications affecting awareness.

A) (13) When handling and disposing of medical waste follow the guidelines in OPNAV Publication-45-113-93, *Afloat Medical Waste Management Guide*, stock number: 0420LP7120900.

c. **General Safety Precautions**

(1) Do not permit any smoking in areas where oxygen is being administered.

(2) Secure all medical equipment having wheels when not in use. Use wheel blocks or securing straps for this purpose.

d. **Medical Equipment and Treatment Precautions**

(1) Stabilize all equipment used in operating rooms in the location it is normally used.

(2) Mount a level on the operating table for use by anesthesiologists when giving spinal anesthesia.

(3) Lock sterilizer doors in the open position with trays locked either in or out to prevent accidental burns.

(4) Inspect stretchers and first aid boxes in accordance with the PMS card.

(5) Ensure operating personnel carefully open autoclave doors after use since the autoclave is a potential source of steam burns to the operator if proper precautions are not followed. The autoclave door should contain a warning label and simply worded operating instructions. Properly label all steam valves and piping to the autoclave.

(6) The electrosurgical unit is a potential hazard of electrical shock for both operator and patient. Ensure proper techniques for grounding the patient are always followed.

(7) Ground the patient when using the cardiac monitor/defibrillator. Do not touch any metal surface when charging the defibrillator paddles.

e. **Heat Lamps**

(1) Accurately time each heat treatment to preclude overexposure or skin burns.

(2) Adjust the heat lamp to limit proximity to a minimum of 24 inches to preclude burns associated with high heat intensities.

(3) Instruct the patient to remove all metal objects (e.g., belt buckles, pendants, and medals) from areas under treatment to preclude burns.

f. **Sitz Bath and Whirlpool Tank**

(1) Do not adjust water temperatures for any treatments in excess of 100°F to preclude potential for first degree burns.

(2) Do not administer such treatments simultaneously with either diathermy or infrared lamp treatments.

(3) Safety check electrical cords to ensure that all cords are in good repair, i.e., without frayed insulation or exposed wires, prior to such treatments to preclude the potential for electrical shock.

(4) Do not connect radios or other electronic devices to electrical outlets while administering such treatments.

CAUTION:
Do not use electrical appliances, other than authorized equipment in the physical therapy spaces at any time.

g. **Electro-Cautery**

(1) Make a safety check prior to using this equipment to ensure proper grounding.

(2) Inspect attached electrical cord to preclude use if cord is frayed or wires are exposed.

(3) Only authorized and adequately trained personnel shall be permitted to operate this equipment.

h. **Defibrillator**

(1) Always double check control settings prior to use.

(2) Conduct safety check of this equipment prior to use to ensure proper grounding.

(3) Only trained personnel under the direct supervision of the Medical Officer shall be permitted to operate this equipment.

(4) Conduct PMS in accordance with the MRC card.

(5) Inspect attached electrical cord to preclude use if cord is frayed or wires are exposed.

i. **Anesthesia Machine**

(1) Perform a daily safety check to ensure effective maintenance of valve fittings.

(2) Only trained personnel under the direct supervision of the general surgeon shall operate this equipment.

(3) Perform a daily inspection to ensure that full tanks of oxygen and nitrous oxide are maintained.

(4) Make periodic changes of calcium carbonate to absorb water and carbon dioxide.

(5) Inspect the anesthesia machine in accordance with the MRC card.

j. **Sterilizer**

(1) Ensure that operating instructions are posted.

(2) Operate battle dressing stations sterilizers once a month to ensure operational efficiency.

(3) Premature depressurization can be hazardous to personnel and equipment.

(4) Ensure that only trained personnel operate the sterilizer equipment.

k. **Medical X-Ray Equipment**

(1) **Personnel Protection**

(a) Wear clothing affording protection from direct radiation.

(b) Do not use movable, upright, protective screens; use more permanent shielding.

(c) Inspect all x-ray protective devices at least annually for efficient barrier protection.

(d) Rotate persons between duties involving possible exposure and exposure free work if they approach their maximum permissible exposure.

(2) **X-Ray Unit**

(a) Perform radiation protection surveys at least every 2 years to evaluate radiation in adjacent spaces and to recommend appropriate shielding or corrective procedures.

(b) Limit and strictly control access to x-ray spaces during x-ray examinations.

(c) Train non-technicians assigned to the x-ray unit work center on radiation hazards.

(d) Ensure that the control panel is secured (locked) at all times to preclude access by non-supervisory personnel.

(3) **X-Ray Film Processor**

(a) Ensure preventive maintenance in accordance with prescribed procedures is performed by qualified personnel (x-ray technician) only.

(b) Ensure that electrical cord is properly grounded.

(c) Turn unit off when not in use to preclude hazards associated with flooding of space or processor tank overflow.

C2103. SAFETY PRECAUTIONS FOR DENTAL FACILITIES

a. Patient Safety

(1) Face dental chairs athwartships during treatment to minimize rolling movements.

(2) Do not compromise proper aseptic techniques due to space or personnel limitations.

(3) Ensure irrigating solutions are made only from stock bottled solutions and are properly labeled as to content.

(4) Store local anesthetics (carpules) in dry containers. Do not keep in holding solutions.

(5) Have appropriate emergency resuscitation equipment on hand and labeled in each dental operating room.

(6) Keep clean and tightly stoppered all dispensing and stock bottles in the dental operating room.

b. Special Precautions

(1) Immobilize equipment during rough seas.

(2) Secure portable mobile anesthesia machines when ships are underway and carefully re-inspect for integrity following rough weather or rough handling.

(3) Ensure that propane gas is turned off when not in use.

(4) Keep to a minimum the flammable materials kept on hand as working stock. The stock will be stored in a separate safe location.

(5) Ensure needles and syringes are accessible only to dental personnel who have a need to use them.

R) (6) Disposable needles and syringes should be disposed in "sharps" containers as an entire unit.

(7) Know the safety precautions relative to electrical equipment, oxygen equipment, use of syringes and needles, use of medications and drugs. Conduct semi-annual training for all dental personnel.

(8) Never use acetylene gas in a copper tubing supply line or any dental operating unit that has copper tubing (or tubing or parts of a copper alloy such as brass) in its gas system.

c. **Dental Operating Room**. Ensure all dental personnel wear eye protection when giving oral prophylaxis. Patients are also required to wear eye protection.

d. **Dental X-Ray Safety Precautions**

(1) **For Operator**

(a) Never stand in the primary ray.

(b) Never hold the film for a patient during exposure.

(c) Always stand at least 5 feet behind or to the side of the tubehead during exposure.

(d) Always wear a film badge for determining the amount of accumulated exposure.

(2) **For Patient**

(a) Use the fastest x-ray film emulsions available.

(b) Use high kilovoltages for faster exposures.

(c) Use lead aprons and thyroid collars on the patient except panographic x-rays where use of the latter is not required.

e. **Dental Equipment**

(1) **Dental Operating Unit (When at Sea)**

(a) Secure all air, gas, electrical and water supplies daily.

(b) Secure bracket table, using shipboard locks if available.

(c) Secure dental operating light, tying it down if necessary.

(d) Secure unit and call dental repairman if air or water leaks occur during normal operation.

(e) Call a qualified electrician to secure power until a qualified dental repairman arrives, if electrical sparks or shocks occur.

(f) Secure gas at the main tanks and call shipfitter, if gas leak occurs.

(2) **Dental Operating Chair**. Have ship's electrician check power supply cord and plug to see that it is a three-conductor cord with ground.

(3) **Dental Cabinets**

(a) Secure dental cabinets to the bulkhead at the end of each working day and secure them to the bulkhead at all times during rough seas.

(b) Check latches before and after each cruise to assure a solid mount to bulkhead is maintained.

(c) Close all drawers at all times.

(d) Make sure locking pedal is depressed to assure cabinet remains in desired position when cabinet is removed from bulkhead for convenience of technician or doctor.

(4) **Amalgamator**

(a) Ensure amalgamator has a three-conductor cord.

(b) Tie down amalgamator if it is not permanently installed on table top counters.

(5) **Autoclaves**

(a) If autoclave is not permanently installed, secure it by a tie-down method to prevent it from falling and causing serious burns.

(b) Never operate autoclave dry.

(6) **Dri-Clave**

(a) Have electrician check power supply cord and plug to see that it is a three-conductor cord with ground.

(b) Check that temperature is not above 320°F (160°C).

(c) Secure dri-clave to shelf or other usable area.

(7) **Oven**

(a) Ensure oven has a three-conductor cord and is permanently installed on shelf or bench.

(b) Do not use oven for other than designated purpose.

(8) **Boil Out Tanks**

(a) Maintain water level during operation to prevent damage.

(b) **DO NOT** operate without sufficient amount of water.

(9) **Electrical Casting Machine**

(a) Use gloves and safety goggles when casting.

(b) Turn off just before casting arm is released when ready to do casting.

(10) **Curing Unit**

(a) Drain water once a week.

(b) Make sure water level is above heating elements when in operation.

(c) Do not operate without sufficient water.

(11) **Equipment Not Hardwired**

(a) If not permanently secured, tie down when not in use.

(b) Wear safety goggles when operating lathe.

(12) **Gas Torches**

(a) Secure gas at the supply source daily as well as at the workbenches.

(b) Secure gas and call shipfitter if the odor of gas appears during work day.

CHAPTER C22

DIVING OPERATIONS NEAR SHIPS

C2201. DISCUSSION

Diving operations near ships can be accomplished for underwater inspection of the hull, screws, rudder or sonar domes, minor underwater ship repairs not requiring drydocking or underwater hull cleaning operations. Routine ship evolutions, such as starting and stopping of sea water pumps, operating sonars, turning screws, and moving the ship's rudder can be extremely dangerous to a diver in the water. This chapter discusses ship safety precautions necessary to reduce the hazards to divers. It does not discuss the hazards and precautions associated with normal diving evolutions.

C2202. DIVING OPERATIONS PRECAUTIONS

a. When diving operations are to be conducted over the side, determine the location and status of all ship's machinery within the diving area prior to such operations. Do not alter the status of this equipment without prior notification of the command duty officer and the officer supervising diving operations. All Navy diving shall be conducted per the U.S. Navy Diving Manual.

b. Refer to NAVSEA 389-0153, Radiological Controls, for requirements for diving operations near nuclear powered ships.

c. A check sheet shall be completed and signed by the command duty officer prior to divers entering the water. A sample check sheet can be found in Appendix C22-A.

d. Notify ships in the vicinity that diving will be conducted.

e. Fly the international signal **"CODE ALPHA"** from the ship and the diving boat.

f. Do not move the ship's rudder with divers in the water. The steering system and cathodic protection source shall be **DANGER** tagged out of service.

g. Do not turn the screw(s) with divers in the water. With the concurrence of the officer supervising the divers, the screw may be turned at minimum jacking speed.

h. Do not adjust mooring lines with divers in the water.

i. Only operate the main circulating water system or take water from the sea after considering the location of the divers and the sea suction intakes. Diving within 50 feet of an active sea suction (located on same side of keel) (R

that is maintaining a suction of 50 gallons per minute (GPM) or more, is not authorized unless considered as an emergency repair and is authorized by the commanding officers of both the repair activity and tended vessel. When it is determined that the sea suction is maintaining a suction of less than 50 GPM and is less than 50 feet, or maintaining a suction of more than 50 GPM and less than 50 feet but on the opposite side of the keel, the diving supervisor must determine if the sea suction is a safety hazard to the divers prior to conducting any diving operation. In all cases the diving supervisor must be aware of the end of the divers' umbilical to ensure that it will not cross over or become entrapped by an active sea suction.

j. When divers are in the water, the anchor shall not be manipulated in any way. The windlass clutch will be engaged, the brake set and the system shall be DANGER tagged.

k. Small boats not involved in the diving operation shall be kept at least 50 yards from the ship.

R) l. No diving operations shall be permitted unless the required number of qualified divers are present, as required by the U.S. Navy Diving Manual, one of which will be a standby diver in a ready condition.

A) m. A diving activity advisary will be passed over the 1MC every 30 minutes. For example, "THERE ARE DIVERS WORKING OVER THE SIDE. DO NOT OPERATE ANY EQUIPMENT, ROTATE SCREWS, CYCLE RUDDER, TAKE SUCTION FROM OR DISCHARGE TO SEA, BLOW OR VENT ANY TANKS, ACTIVATE SONAR OR UNDERWATER ELECTRICAL EQUIPMENT, OR OPEN OR CLOSE ANY VALVES BEFORE CHECKING WITH THE DIVING SUPERVISOR."

n. When divers are in the water, do not operate any active sonar whether diving alongside or near another ship in close proximity.

o. The above precautions apply when divers are working on or near adjacent ships. Clear with the command duty officer before performing any evolution above.

Appendix C22-A

DIVERS OVER THE SIDE CHECK SHEET

USS _____

1. Diving will be conducted over the side, commencing at _____ (time/date).

2. The following work is to be accomplished by the divers: _____

_____

3. Diving will be in the following location(s): _____

_____

4. Prior to a diver entering the water, accomplish the following:

Initials

_____ a. Notify the engineer officer/engineering duty officer of the diving operation. Determine the operating status of sea water systems within the diving area. Direct no alterations of this status (except as described in f below) without the permission of the engineering duty officer. Inform diving supervisor of systems in operation.

_____ b. Notify reactor officer/radiation control officer (nuclear powered ships only). Ensure divers have radiological protection specified by the reactor officer.

_____ c. DANGER tag-out rudder to ensure no movement and secure and tag-out the cathodic protective source.

_____ d. Ensure that screws are on the jacking gear and locked (screws may be turned at minimum jacking speed with the concurrence of the diving supervisor).

_____ e. Do not permit mooring line adjustment.

_____ f. Do not permit main circulating water system components to be operated.

_____ g. DANGER tag-out anchor windlass and brake to ensure no manipulation in any way.

161-521 O - 94 - 7

_____ h. Do not conduct boiler/steam generator blow downs or if a nuclear powered ship, permit no discharge of radioactive effluent.

_____ i. Keep all small boats outside a 50 yard radius of the diving operations.

_____ j. Do not permit diving unless the required number of qualified divers in accordance with the U.S. Navy Diving Manual are present with one diver out of the water in a ready condition as a standby diver.

_____ k. If equipped with thrusters or electric propulsion motors, tag them out to ensure they are not operated.

_____ l. Do not permit any active sonar to be operated.

_____ m. Notify adjacent ships or other ships in a nest of the diving operations. Request the command duty officers of these ships to not permit active sonar operation.

_____ n. Fly **CODE ALPHA**. Ensure this signal is flying from the diving boat.

R) _____ o. Pass the following word prior to the divers entering the water: For example, "THERE ARE DIVERS WORKING OVER THE SIDE. DO NOT OPERATE ANY EQUIPMENT, ROTATE SCREWS, CYCLE RUDDER, TAKE SUCTION FROM OR DISCHARGE TO SEA, BLOW OR VENT ANY TANKS, ACTIVATE SONAR OR UNDERWATER ELECTRICAL EQUIPMENT, OR OPEN OR CLOSE ANY VALVES BEFORE CHECKING WITH THE DIVING SUPERVISOR." The message should be passed every 30 minutes.

5. Conditions have been established to permit diving operations.

_____ Command Duty Officer/Time

Diving Commenced _____

Diving Completed _____

Note: Initials certify completion of an item. If an item is not applicable, indicate "NA" on initial line.

CHAPTER C23

HAZARDOUS MATERIAL STORAGE, USE, AND DISPOSAL PRECAUTIONS

C2301. DISCUSSION

Special precautions are required for the stowage, handling, and use of hazardous materials (HM) aboard ship. Significant hazards include fire, poisoning by breathing toxic substances in unventilated spaces, dermatitis, asphyxiation, and burns of the skin and eyes. Some materials normally thought to be safe may become hazardous under certain use or storage conditions. This chapter contains general precautions for stowage and use of all HM, precautions for subcategories of HM (flammable materials, toxic materials, corrosive materials, oxidizers, aerosol containers, and compressed gases), and specific precautions for certain selected materials. **Related information is in Chapter B3, which describes the HM control and management program** including procedures for purchase, receipt, issue, and disposal of HM; responding to HM spills; obtaining material safety data sheets (MSDS); and training personnel on HM use and storage requirements.

C2302. GENERAL STORAGE REQUIREMENTS

The following general precautions must be observed to minimize hazards inherent in the handling and storage of HM:

NOTE: (A

Precautions are applicable to storage of HM in all locations.

a. Mark stowage compartments to identify type of HM stored and keep the compartment/materials clean and dry at all times.

b. Provide adequate ventilation throughout all HM storage areas. Keep ventilation system in good operating condition. All HM stowage areas must be evaluated by an industrial hygienist prior to designated stowage of HM. Prohibit unauthorized personnel from entering HM storage areas.

c. Allow only authorized personnel in stowage areas.

d. When transferring material from one container to another, retain existing (R precautionary labeling and ensure subsequent containers are marked with appropriate precautionary labeling. Annotate the unmarked container to indicate the material name, manufacturer name and address, and the nature of the hazard (including target organ) as specified by the manufacturer when HM is dispensed to an unmarked container to preserve the continuity of information. DD 2521 and DD 2522 may be used for labeling of containers into which HM is transferred.

e. Do not transfer material to any container that was previously used for a different material without first checking the materials' compatibility. If unsure, check with the HM Coordinator.

f. Stow incompatible materials in separate compartments to prevent mixing in the event of a spill. See Appendix C23-A: Hazardous Material Compatibility Storage Diagram.

g. Stow HM only in containers that are compatible with the material (e.g., do not place corrosive materials in metal drums).

h. If space limitations necessitate storing incompatible materials in the same compartment, maintain a separation distance of at least 3 feet. This provides only limited protection and all precautions, such as high coamings, shall be used to prevent accidental mixing. Coamings will not prevent vapors, generated from incompatible HM in spaces, from mixing and reacting.

i. Stack containers so that they will not crush lower containers, become imbalanced, or be difficult to access.

j. Issue material on a first-in, first-out basis, considering shelf life.

k. Prohibit smoking, eating, or drinking in stowage areas.

l. Never permit open flames or spark producing items in HM stowage areas.

m. The gas free engineer shall monitor stowage compartments for oxygen depletion, suspect explosive atmospheres, presence of potentially toxic vapors, and CO_2 accumulation any time the question arises as to the safety of a stowage area.

n. Operate only explosion-proof electrical equipment in a potentially explosive environment.

o. Seal and protect all containers against physical damage and secure for heavy seas.

p. Maintain explosion-proof electrical fixtures in proper condition in applicable HM stowage areas.

q. Do not stow HM in spaces or locations not designated for such stowage.

C2303. GENERAL HANDLING AND USE REQUIREMENTS

R) The *Hazardous Material User's Guide* (OPNAV Publication P-45-110-91) provides information on the handling and use of 22 HM groups. This guide should be consulted for precautions on handling and use of HM within these groups. Observe the following general requirements when handling HM:

a. Work center supervisors shall ensure that, prior to using any HM, personnel under their supervision are trained on the hazards associated with that material, and that they have been provided with necessary protective clothing and equipment (i.e., eye protection, respirators, and gloves).

b. Work center supervisors shall ensure that adequate supply and exhaust ventilation is maintained in all spaces where HM is used, that such systems are in good operating condition, and that they have been evaluated as adequate by an industrial hygiene survey team. Keep ventilation intakes clear of HM at all times.

c. Never store excess supplies of HM in work areas. Return surplus (R material to the appropriate storage area or HAZMAT center when not being used.

d. Handle incompatible materials in separate compartments to prevent mixing in the event of a spill.

e. Never mix incompatible materials in the same collection containers.

f. Avoid breathing vapors or dust when using HM.

g. Avoid contact with the eyes or prolonged contact with skin when using HM.

h. Prohibit smoking, drinking, or eating in areas where HM is used.

i. Ensure personal protective equipment (eye protection, respirators, gloves appropriate to the HM in use, etc.) is in good operating condition and is readily available to all personnel working with HM.

j. Eye protection against irritating or corrosive chemicals shall consist of chemical goggles and full-face shields which have been cleaned and disinfected before being issued to another wearer.

k. Before entering spaces that have been closed for significant periods of time, have a gas free engineer determine that atmosphere is safe for entry.

l. Use an appropriately selected and fitted respirator when potentially exposed to particulate matter, hazardous gases, or vapors. When in doubt, consult the MDR for specific guidance in this regard or for a determination of the need for more stringent respiratory protection requirements.

C2304. HAZARDOUS MATERIAL MINIMIZATION CENTER (HAZMINCEN) PROCEDURES (A

If the ship has an established HAZMINCEN, use the following procedures to control common-use HM:

a. When HM is required to perform corrective, preventive, or facility maintenance, notify the ship's HAZMINCEN of the requirement and the amount of HM needed per the procedures established by the ship or type commander.

b. The HAZMINCEN shall fill the request from existing HM stores. Normally, HM will only be provided in the quantities necessary to perform the required maintenance. The HM issued shall be entered into the Hazardous Material Inventory Control System (HICS) by HAZMINCEN personnel.

NOTE:

When HM is dispensed from the original shipping container to another unmarked container, annotate the unmarked container to indicate the material name, manufacturer name and address, and the nature of the hazard (including target organ) as specified by the manufacturer to preserve the continuity of information. To mark unlabeled containers, use the Department of Defense (DOD) Hazardous Chemical Warning Label. This label and label information is provided in the HMIS, at the end of each MSDS. The label can be printed on plain paper or the pre-printed color forms, DD 2521 (8.5"x11") (S/N 0102-LF-012-0800) or DD 2522 (4"x7") (S/N 0102-LF-012-1100).

c. Upon completion of the maintenance or the working day, if maintenance has not been completed, return the remaining unused HM or the empty container as well as any used HM or residue resulting from the maintenance to the HAZMINCEN for processing. Enter the return of the HM into HICS.

NOTE:

Only HM uniquely used by the workcenter (for example, calcium hypochlorite used for water treatment or sanitization) shall remain in the custody of the workcenter at the completion of work. All other material shall be returned to the HAZMINCEN.

d. The HAZMINCEN shall consolidate unused HM for reissue. Consolidate used HM, where possible, and process for disposal per the procedures of section B0307.

NOTE:

Segregate used HM that is collected. A container shall normally be filled with one type of HM, i.e., all used HM in a container shall normally be of only one stock number (except when the difference in stock number is only due to the size of the container). Either place used HM in the container for the original material or in an impervious container specified in appendix B3-D. Securely seal the container using the installed or provided closure devices to ensure the container does not leak during transportation. Properly label the container (refer to paragraph B0307c for labeling requirements) to indicate content, and stowed in an appropriate location.

e. At the end of the workday, HAZMINCEN operators shall use HICS to print a report of the workcenters delinquent in returning unused HM or the empty container. Any material not returned should be vigorously sought out.

C2305. FLAMMABLE AND COMBUSTIBLE MATERIAL

A flammable material is any solid, liquid, vapor, or gas which will ignite easily and burn rapidly with a flash point less than 1500°F. A flammable liquid is defined by the National Fire Protection Association (NFPA) as a liquid with a flash point below 100°F and having a vapor pressure not exceeding 40 lbs./square inch. Liquids having a flash point at or above 100°F are combustible liquids. All flammable and combustible liquids pose a danger to personnel and the ship, particularly those liquids having flash points below 200°F. Never carry flammable or combustible liquids aboard ship in quantities in excess of that required. Stow flammable and combustible liquids in approved locations. Dispense flammable and combustible liquids from shipping containers only into safety cans or other approved portable containers. Never use flammable or combustible liquids near a heat source or spark-producing device.

a. **Storage Requirements**

(1) Store flammable and combustible materials following the precautions listed in paragraph C2302.

(2) Store flammable and combustible materials separately from oxidizing materials (i.e., sodium nitrate, calcium hypochlorite, potassium permanganate, peroxides, and strong inorganic acids (nitric, hydrochloric, and sulfuric acids)). See appendix C23-A: Hazardous Material Compatibility Storage Diagram.

(3) Authorized storage locations for flammable and combustible materials are limited to the following:

	Material	Location
(a)	Liquids with flash points below 200 degrees Fahrenheit	Flammable liquids storeroom/ in-use flammable liquids stowage cabinet (in-use material only).

NOTES:

1. No in-use storage of these materials is allowed in machinery spaces.

2. In nuclear powered ships, small amounts of isopropyl alcohol (less than two quarts) may be stowed in a nucleonics room or secondary chemistry room cabinet.

Material	Location
(b) Solids and semi-solids which readily give off flammable vapors.	Flammable liquids storeroom
(c) Solids which burn with extreme rapidity because of self-contained oxygen.	Flammable liquids storeroom/ in-use flammable liquids stowage cabinet
(d) Materials which ignite spontaneously when exposed to air.	Flammable liquids storeroom
(e) All lubricating oils and petroleum products with a flash point greater than or equal to 200 degrees Fahrenheit but less than 1,500 degrees Fahrenheit.	Flammable liquids storeroom/ flammable liquids commercial cabinet (in-use material only)/Up to 12 Gals. within a coaming capable of containing the total amount stowed (in-use material only)

(f) Store cargo of the type described in (e) above, carried by **Cargo Ships and Oilers** in either a cargo hold under fixed HALON® or CO_2 gas flooding or sprinkler protection or on the weather deck under protection from the elements. Normally stow used/excess HM aboard combat logistics force ships, carried for the purpose of easing used/excess HM stowage requirements of combatants or for retrograding such material to the continental U.S. (CONUS), on the weather deck under protection from the elements unless below decks cargo stowage for this material is available aboard the ship.

(g) Ensure ordinary combustible materials such as rags, paper and wood are not stowed in flammable stowage areas; however, oily rags should be stowed in these areas after being placed in suitable containers.

(4) Prohibit open flames or spark-producing items in flammable stowage areas.

(5) Ensure containers are secured with metal banding or other approved tie-downs vice manila line.

b. **Handling and Usage Requirements**

(1) Handle and use flammable and combustible materials per the precautions listed in paragraph C2303. Many flammable and combustible materials have additional hazardous properties, such as toxicity. See also paragraph 2306.

(2) Never use a flammable material near a heat source or a spark-producing device. Do not smoke in an area in which flammable material is being used. Post spaces in which flammable materials are used as **NO SMOKING** areas.

(3) Keep scrapings and cleaning rags soaked with flammable or combustible liquids in a covered metal container. Do not leave scrapings and cleaning rags in a soaked state even in a covered metal container for longer than one work shift. Treat such materials as used/excess HM, containerize to prevent leakage, and properly label and store.

(4) Ensure that containers of partially used flammable materials are returned to proper stowage facilities, are tightly closed, and are properly labeled.

(5) Keep suitable fire extinguishing equipment and materials ready at all times for instant use.

C2306. TOXIC MATERIAL

A toxic material has the inherent capacity to produce personal injury or death through ingestion, inhalation, or absorption through any body surface. Toxic materials are considered, and often marked by the manufacturer as being, poisonous. Avoid contact with toxic materials by the proper use of suitable impermeable protective clothing, respiratory protection, and by strictly following all prescribed safe handling procedures. Solvents, degreasers, refrigerants, mercury, and hydraulic fluids are but a few of the toxic materials that may be found aboard ship. If stowed, handled, and used in the proper manner, they present little or no danger. (R

a. **Storage Requirements**

(1) Store all toxic material per the precautions listed in paragraph C2302. Many toxic materials have additional hazardous properties, such as flammability or combustibility. See also paragraph C2305. (R

(2) Store all toxic material in cool, dry, well ventilated spaces separated from all sources of ignition, acids and acid fumes, caustics, and oxidizers. See Appendix C23-A: Hazardous Material Compatibility Storage Diagram.

(3) Seal all containers and protect them against physical damage.

b. **Handling and Usage Requirements**

(1) Handle and use toxic materials per the precautions listed in paragraph C2303.

(2) Use appropriate gloves and protective clothing when handling sensitizers or potential skin irritants such as epoxy and polyester resins and hardeners where significant skin contact is likely. Protective skin cream shall only be used to supplement, but not replace, the appropriate gloves for any operation where significant contact with potentially toxic/irritant/sensitizing materials is likely.

c. **Halocarbons (Refrigerants)**. Liquid or gaseous halocarbons have multiple applications in the Navy. They are used as refrigerants, aerosol propellants, solvents, and dielectric fluids and as line flushing, fire extinguishing, and degreasing agents. With common names of refrigerant R-11, R-12, R-22, R-113, R-114, and R-116, these products may be better known by names such as FREON®, ISOTRON®, FRIGEN®, FLUORANE®, FREON MF®, FREON TF®, GENSOLV D®, BLACO-TRON TF®, and ARKLONE P-113®.

(1) To minimize the size of spills, procure, store, and use halocarbons in the smallest amount and container possible for an operation.

(2) All normally used halocarbons are stocked in the Naval Supply System and should be procured only through that system.

(3) Prohibit smoking and hot work in areas or vicinity where halocarbons are being used.

(4) Prohibit storage and consumption of food and tobacco in areas where halocarbons are being used.

(5) Some types of FREON® are nearly odorless and can numb the sense of smell.

(6) Only use FREON-113® as a solvent when specified and when such use is essential.

(7) For system filling or flushing:

(a) Establish constant communications between personnel manning the halocarbon pumps and the equipment being serviced.

(b) Ensure adequate warning signs are posted around the area and access to area where halocarbons are being used. Warning signs should state:

VAPORIZATION OF THIS PRODUCT CAN DISPLACE OXYGEN NECESSARY FOR BREATHING AND MAY CAUSE SUFFOCATION WHEN IN CLOSED SPACES OR AREAS WITHOUT VENTILATION. HEATED VAPOR CAN PRODUCE TOXIC GASES. EXPOSURE TO HIGH CONCENTRATION CAN CAUSE HEART IRREGULARITIES OR DEATH.

(c) Verify filling and flushing system integrity with a pressure drop test. Do not over-pressurize the system during the test.

(d) Install supplemental exhaust ventilation (i.e., red devil blower) at the point of vapor generation. A red devil blower should be rigged with hoses so that a suction is drawn as near the source as practical and an equal supply of make-up air is provided to the space. Discharge exhaust external to the ship. Power sources for the blower are located on the damage control deck.

(e) Vent purge overboard so as to avoid recirculation.

(f) Provide emergency escape breathing devices (EEBDs) in areas where halocarbons are used. Do not use EEBDs in the event a halocarbon spill occurs and personnel must remain in the space due to operational requirements. EEBDs are to be used only to escape from a hazardous atmosphere. Provide either an oxygen breathing apparatus, supplied air respirator with emergency egress air supply, or a self-contained breathing apparatus to personnel remaining in a halocarbon spill area.

(g) Ensure confined or enclosed spaces are designated safe for work by the gas free engineer or marine chemist.

(h) Provide personal protective equipment (e.g., chemical goggles, full-length face shield, neoprene gloves, and apron). In the event of a large spill and subsequent cleanup, use of impermeable coveralls and boots or shoe covers may be required.

(i) Assign a minimum of two people to each work space.

(j) Monitor halocarbon and oxygen levels in each work space.

d. **Toxic Cleaning Solvents**. Conduct shipboard operations involving toxic cleaning solvents in a manner which will not result in exposure of personnel to hazardous concentrations of airborne materials, significant or prolonged skin contact, the creation of a potentially explosive atmosphere, or reduce oxygen levels below safe limits. Ensure spaces subject to accidental or uncontrolled concentration of toxic vapors are checked by a gas free engineer and certified safe for entry prior to beginning work. Use mechanical exhaust ventilation (explosion proof) to exhaust vapors overboard to prevent reentry and recirculation. Eliminate sources of ignition of vapors prior to ventilating such spaces. For normal cleaning operations:

(1) Whenever practicable, completely enclose the cleaning operation to prevent escape of vapors into working spaces.

(2) Ensure exhaust ventilation is available to remove or dilute the concentration of the vapors for the entire work period. If exhaust ventilation is not present to lower vapor concentration, use respiratory protection equipment.

(3) Wear gloves appropriate to the HM in use and chemical goggles, at a minimum, to protect the skin and eyes from exposure.

(4) Use chemical goggles and other protective clothing appropriate to the HM in use to protect the face, neck, arms, hands, and body when using acid or alkali cleaners.

e. **Trichloroethane** (also known as 1, 1, 1-Trichloroethane and inhibited methyl chloroform) is a halogenated hydrocarbon extensively used as a solvent for greasy films and oil deposits on machinery and other equipment. When properly used, its vapors have a low order of toxicity. However, vapors of this solvent, especially when sprayed or heated, will readily accumulate in confined spaces and increase the chance of harmful exposure. Trichloroethane is toxic if

taken internally and when heated, separates into subproducts which may be more toxic.

C2307. CORROSIVE MATERIALS

Corrosive materials are chemicals such as acids, alkalies, or other liquids or solids which, when in contact with living tissue, will cause severe damage to such tissue by chemical action. In case of leakage, corrosive material will materially damage surfaces or cause fire when in contact with organic matter or with certain chemicals.

a. Storage Requirements

(1) Store all corrosive materials per the precautions listed in paragraph C2302.

(2) Store corrosive materials in their properly labeled, original containers.

(3) Ensure that acids and alkalies are stowed separate from each other.

(4) Ensure that corrosive materials are not stored in the vicinity of oxidizers or other incompatible materials. See Appendix C23-A: Hazardous Material Compatibility Storage Diagram.

b. Handling and Usage Requirements

(1) Handle and use corrosive materials per the precautions listed in paragraph C2303.

(2) Wear chemical goggles and full-face shields, rubber gloves, rubber boots, and aprons when handling acids or other corrosive materials.

(3) Never allow corrosive materials or their vapors to come in contact with the skin or eyes.

c. Inorganic Acids

(1) Stow liquid inorganic acids, such as hydrochloric, sulfuric, nitric and phosphoric acids bottled in glass or plastic in such a manner that they are cushioned against shock. They should be kept in their original shipping carton inside suitable acid-resistant lockers, cabinets or chests, located in storerooms below the full-load waterline. Except where stowed in chests or lockers, the lower part of the bulkheads where acids are stored shall be provided with a watertight acid-resistant rubber lining.

(2) Maintain hydrofluoric acid in acid-proof polyethylene or ceresin-lined bottles at all times and never allow them to come in contact with skin or eyes.

(3) Stow medical acids in lead-lined containers in the medical storeroom.

(4) Do not stow inorganic acids in flammable liquid storerooms, except when contained within an acid stowage locker. Since many inorganic acids are oxidizers, stowage in a flammable liquid storeroom, even in an acid locker, should be avoided.

d. **Organic Acids**. Do not permit liquid and solid organic acids, such as glacial acetic, oxalic, carbolic, cresylic, and picric acids to come in contact with the eyes or skin. These acids are corrosive to aluminum and its alloys, to zinc, and to lead. Keep these acids, usually packaged in glass bottles, from freezing and physical damage. Stow these acids in a locker lined with acid-resistant material in the flammable liquids storeroom separated by a partition, or by at least 3 feet, from all other material.

e. **Alkalies**. Stow alkalies (bases), such as lithium hydroxide, sodium hydroxide, potassium hydroxide (lye), disodium phosphate, trisodium phosphate, sodium carbonate, and ammonium hydroxide (ammonia water) in designated lockers, cabinets, or chests. Keeps alkalies separated from acids, oxidizers, and other incompatible materials. Ensure the stowage area is dry.

NOTE:

Many shipboard cleaning agents and laundry materials contain alkalies in very strong concentrations. Specified stowage and handling precautions for these materials must be observed.

C2308. OXIDIZERS

An oxidizer is any material, such as chlorate, perchlorate, permanganate, peroxide, or nitrate which yields oxygen readily to support the combustion of organic matter, or which may produce heat, or react explosively when it comes in contact with many other materials. Higher temperatures increase the possibility of oxygen release from oxidizers and the possible initiation of fire. Heat shall be avoided when handling and storing oxidizers.

a. **Storage Requirements**

(1) Store oxidizers following the precautions listed in paragraph C2302.

(2) Do not store oxidizers in an area adjacent to a magazine or heat source or where the maximum temperature exceeds 100 degrees Fahrenheit under normal operating conditions.

(3) Ensure that oxidizers are not stored in the same compartment with easily oxidizable material such as fuels, oils, solvents, grease, paints, or cellulose products. See Appendix C23-A: Hazardous Material Compatibility Storage Diagram.

b. **Handling and Usage Requirements**

(1) Handle and use oxidizers per the precautions listed in paragraph C2303.

(2) Do not use oxidizers in an area where they might mix with easily oxidized materials (i.e., fuels, solvents, oils, grease, paints, or cellulose products).

(3) When transferring oxidizers to second containers, **ensure that the second container is compatible with the oxidizing material**. Place appropriate warning labels on the second container.

(4) Do not remove or obliterate warning labels from containers.

(5) Ensure oxidizing materials are only handled or used by authorized personnel.

c. **Calcium hypochlorite** is a very strong oxidizer used to provide the sanitizing and bleaching property of chlorine without requiring the handling of liquid or gaseous chlorine.

(1) The following precautions apply to the stowage of calcium hypochlorite:

(a) Stow the ready usage stock of 6-ounce bottles issued to the medical and engineering departments in a locked box mounted on a bulkhead, preferably in the cognizant department office space. Do not, under any circumstances, install the box in a machinery space, flammable liquids storeroom, berthing space, storeroom, or in the oil and water test laboratory areas. A metal box such as a first aid locker is recommended for this purpose. Drill three vent holes in the bottom of the box, each 1/4 inch in diameter, to allow the release of any chlorine products. (The metal box is a standard stock item, readily available, is relatively inexpensive and requires only repainting to be suitable). No more than 3 days' supply of calcium hypochlorite shall be maintained in ready usage stock at any one time. Only 6-ounce bottles are to be used as ready usage. The use of 3-3/4-pound bottles of calcium hypochlorite as ready usage stock is prohibited.

(b) Stow ready usage stock for sewage disposal treatment in steel or aluminum cabinets or racks located on a bulkhead in the macerator-chlorinator space. Do not stow paints, oils, greases, or combustible organic material in this space. Equip cabinets or racks with shelving and retaining bars to secure the individual containers.

(c) Stow storeroom stocks in labeled, ventilated lockers, or bins. Locate these lockers or bins in an area where the maximum temperature will not exceed 100 degrees Fahrenheit under normal operating conditions and which is not subject to condensation or water accumulation. The area shall not be adjacent to a magazine, and the lockers and bins shall be located at least 5 feet from any point heat source or surface which may exceed 140 degrees

Fahrenheit. Do not locate these lockers in an area used for stowage of paints, oils, greases, or combustible organic materials. Do not stow more than 48 6-ounce bottles or 36, 3-3/4-pound bottles in any individual locker or bin. Only issue calcium hypochlorite to personnel designated by the medical or engineer officer.

(d) Stow calcium hypochlorite, carried as cargo, in a separate enclosure constructed of steel or expanded metals. Ensure that the enclosure has a secure door. Do not locate the enclosure in an area used for stowing paint, oils, greases, or other combustible materials. Locate the enclosure in an area where maximum temperature will not exceed 100 degrees Fahrenheit under normal operating conditions and is not subject to condensation or water accumulation. Do not locate the enclosure adjacent to a magazine and within 5 feet from any point heat source. Sprinkler protection is not required but need not be avoided. For unpalletized material, equip the enclosure with shelving and retaining bins to contain securely the individual boxes.

(e) Label all lockers, bins, and enclosures with red letters on a white background:

HAZARDOUS MATERIAL, CALCIUM HYPOCHLORITE

(2) The following precautions apply when using calcium hypochlorite:

(a) Mix only with water.

(b) Do not allow to come into contact with paints, oils, greases, wetting agents, detergents, acids, antifreeze, alkalis, or organic and combustible materials.

(c) Do not remove or obliterate warning labels.

(d) Dispense only in clean, dry utensils and only in amounts required for immediate use.

(e) Avoid contact with skin and eyes.

(f) Ensure containers are not used for any other purpose.

(g) For external contact or if taken internally, follow the instructions printed on the container label or in the MSDS.

(h) No special firefighting precautions are required for fires caused by calcium hypochlorite.

d. **Organic Chlorine Laundry Bleach**. This bleach contains an organic chlorine-liberating compound and was selected as a less HM to replace calcium hypochlorite as a laundry bleach. However, under conditions of high heat and humidity, organic chlorine laundry bleach emits vapors that can be hazardous to personnel. Stow this bleach in a cool, dry place as far from conditions of

high heat and humidity as possible. Do not mix with materials containing ammonia.

C2309. AEROSOLS

Materials in aerosol containers: There is an ever-increasing demand for pressurized (aerosol) dispensers for the dispersal of paints, enamels, lacquers, insecticides, inspection penetrant kits, lubricating oils, silicones, shaving creams, and rust preventative. The aerosol propellants may be low-boiling halogenated hydrocarbons or other hydrocarbons which are flammable, such as propane or isobutane. The contents of the aerosol-type pressurized containers are under pressure, and exposure to heat may cause bursting of the dispensers. The propellants in higher concentrations are anesthetic, asphyxiating, and extremely flammable. The decomposition products formed when propellants contact open flames or hot surfaces may be corrosive, irritating, or toxic.

a. **Storage Requirements**

(1) Stow aerosols following the precautions listed in paragraph C2302.

(2) Ensure that inside stowage of aerosols is in the flammable liquids storeroom. See Appendix C23-A: Hazardous Material Compatibility Storage Diagram.

(3) Stow ship's stores aerosol stock items in the flammable liquids storeroom.

(4) Do not stow containers in areas with temperatures above 120 degrees Fahrenheit or adjacent to steam lines, hot zones, or heat sources.

(5) Limit ready-usage stocks of any one product located at work areas to 1 week's supply.

b. **Handling and Usage Requirements**

(1) Handle and use aerosols per the precautions listed in paragraph C2303.

(2) Never use aerosols near a heat source or a spark-producing device. Do not smoke in the area in which aerosol material is being used.

(3) Keep aerosol containers away from steam lines, electronic equipment, hot water, and other heat sources.

(4) Avoid prolonged exposure of aerosol containers to sunlight.

(5) Avoid prolonged or repeated inhalation of aerosol spray or vapors of residual liquid.

(6) Do not disperse aerosol spray near flames, hot surfaces or ignition sources due to potential hazards from thermal decomposition products.

(7) Ensure food or tobacco products are not contaminated with spray.

(8) Avoid accumulation of wetted rags or clothing which may be subject to spontaneous heating or ignition. Ignition may be initiated by the temperature of low-pressure steam pipes, the surfaces of incandescent light bulbs, sunlight, or any other heat source.

(9) Avoid accumulation of aerosol or flammable concentrations of aerosol spray or vapors in the air.

(10) Prohibit puncture or incineration of aerosol dispensers unless (R
equipped with a NAVSEASYSCOM-approved can puncturing device.

(11) Use aerosols containing material with a flash point less than 73 degrees Fahrenheit on board ship only when required for a specific use and authorized by the cognizant division officer.

C2310. COMPRESSED GASES

Aboard Navy ships numerous cylinders of compressed gases will be found. Compressed gases are used for welding operations (oxygen and acetylene), in refrigeration and air conditioning systems (FREON®), and for purging various systems (nitrogen). Cylinders of compressed gases are potential explosion, fire, and health hazards if strict compliance with existing requirements are not met.

a. **Storage Requirements**

(1) General

(a) Only stow compressed gases, with the exception of flammable and explosive gases and ready service cylinders, in compartments designated for cylinder storage, as shown in applicable plans for each ship. Whenever practical, stowage shall permit removal of any cylinder without disturbing other cylinders. Such compartments shall:

1. Be kept free of all flammable materials (especially greases and oils).

2. Be maintained at temperatures below 130 degrees Fahrenheit.

3. Have instructions posted at all entrances requiring ventilation of the compartment for a period of at least 15 minutes prior to entry.

(b) Securely fasten each individual cylinder in the vertical position (valve end up) by metal collars and with horizontal restraints to meet Grade "B" shock mounting requirements.

(c) Stow cylinders by date of receipt, and place into service in the order of receipt.

(d) Tag empty cylinders **EMPTY**, or mark **MT**, and segregate from full or partially full cylinders.

(2) Oxygen

(a) Only stow oxygen cylinders in designated, well-ventilated spaces except as noted in paragraph C2310a(4)(b).

(b) Conduct an atmospheric analysis prior to entry into any sealed compartment where oxygen is stowed as specified in Chapter B8.

(3) Flammable and Explosive Gas Weather Deck Stowage. Unless approved below-deck stowage locations are shown on a ship's plan, all flammable and explosive gas storage shall be on the weather deck. Take the following precautions, in addition to those in paragraph C2310a when storing flammable or explosive gasses on the weather deck:

(a) Never stow oxygen bottles in close proximity to fuel gas cylinders.

(b) Screen cylinders from the direct rays of the sun.

(c) Protect cylinder valves during winter months from accumulations of snow and ice.

(d) Make every effort to prevent corrosion of threaded connections on cylinders. However, under no circumstances use grease or flammable corrosion inhibitors on oxygen cylinders.

(e) Ensure stowage areas are as remote as possible from navigating, fire control, and gun stations.

(f) Keep all flammable materials, especially greases and oils, out of the stowage area.

(4) Ready Service

(a) The following gas cylinders, when in use or staged for use, are permitted below decks outside of stowage compartments:

1. Fire extinguishers (portable).

2. Fire-extinguishing cylinders permanently connected to fixed fire-extinguishing systems.

3. Gas and chemical canisters for oxygen breathing apparatus.

4. Welding cylinders.

5. Medical gas cylinders.

6. Cylinders containing refrigerants.

7. Disposable cylinders supplied as repair kit accessories (halide leak detector kits, for example).

(b) Welding Cylinders. Observe the following special instructions and precautions regarding oxygen and fuel gas cylinders in ready service:

1. Install cylinders of gas necessary to equip each authorized shop and repair locker in accordance with approved plans or specifications.

2. Fasten cylinders securely in a rack (stationary or wheeled). Ensure acetylene cylinders are always stowed vertically. Securely fasten the rack, in turn, to the bulkhead at the designated locations.

3. Never leave equipment unattended.

4. Return welding units to designated stowage as soon as work is complete.

5. Post the following warning at each designated stowage location:

WARNING

NOT SECURE

Unit is **NOT SECURE** while pressure shows on gauges, or when cylinders are not firmly fastened to rack or to bulkhead, or when rack is not firmly fastened to bulkhead. If removed from this location, this unit is to be constantly attended until returned and secured.

6. Attach a card to each welding unit with the following instructions:

Return to (designated location) immediately on completion of work. Unit shall not be left unattended while away from above location. Unit is **NOT SECURE** while pressure shows on gauges, or cylinders are not firmly fastened to rack, bulkhead, or stanchion.

b. **Handling and Usage Requirements**

(1) Never drop cylinders nor permit them to strike against one another violently.

(2) Never use a lifting magnet or a sling (line or chain) when handling cylinders. If a crane or hoist is used, provide a safe cradle or platform to hold cylinders.

(3) When returning empty cylinders, be sure that valves are closed and that valve outlet, if provided, and cylinder valve protection caps are in place.

(4) Be sure that all cylinders in the ship's stores are approved under Department of Transportation (DOT) regulations. Non-magnetic cylinders are an exception.

(5) Refill cylinders only when such action is specifically approved by the command.

(6) Fill a cylinder only with the gas for which the cylinder has been specifically designated.

(7) Do not remove or change the numbers or marks stamped into cylinders without the specific approval of the Defense General Supply Center.

(8) Never use cylinders for rollers, supports, or for any purpose other than to carry gas.

(9) Never tamper with the safety devices on valves or cylinders.

(10) Never hammer or strike the valve wheel in attempting to open or close valves. Use only wrenches or tools provided and approved for this purpose.

(11) Be sure that the threads of regulators or other auxiliary equipment are the same as those on cylinder valve outlets. Never force connections that do not fit.

(12) Do not use regulators, pressure gauges, manifolds, and related equipment that are provided for a particular gas on cylinders containing different gases.

(13) Repair or alter cylinders or valves only when authorized by NAVSEASYSCOM.

(14) Unless specifically authorized, never subject compressed gas cylinders, either in stowage or in service, to a temperature in excess of 130 degrees Fahrenheit. Do not allow a direct flame to come in contact with any part of a compressed gas cylinder. For carbon dioxide extinguishers in spaces above 130 degrees Fahrenheit, see NSTM 555.

(15) Protect cylinders from objects that will cut or otherwise abrade the surface of the metal.

(16) When testing for leaking gas cylinders, use soapy water or leak-detection compound conforming to MIL-L-25567.

(17) Only use a gas cylinder that is properly marked (by color of paints or with the name of the gas stenciled on cylinder and valve). Return all mis-marked cylinders to the nearest Naval Supply Depot.

(18) Work center supervisors shall ensure that supply and exhaust ventilation exists in compartments where compressed gases are stored or in use, systems are in good operating condition, and have been evaluated as adequate by an industrial hygiene survey team.

(19) To thaw out valve outlets that are clogged with ice, use warm (not boiling) water. The use of boiling water will melt the fusible plugs, if present, and vent the cylinders.

(20) Never discharge a cylinder into any device or equipment in which the gas will be entrapped and create pressure. The only exception is a cylinder equipped with a pressure regulator set to control the pressure.

(21) Never use oil-tolerant gases when oil-free gases are required. This practice is discouraged by the fact that valve outlets are not inter-changeable, however, there have been cases in which this safety feature has been overcome by homemade adapters.

c. **Recharging Cylinders Aboard Ships**

(1) Recharge only oxygen, nitrogen and carbon dioxide cylinders, except as noted in paragraph C2310c(2).

(2) Ensure that the recharging is supervised by a graduate of the Fleet Training Center Cryogenics School.

NOTE:

Small cylinders of hydrogen routinely used for nuclear propulsion plant operations may be refilled without a graduate of Cryogenics School being present.

(3) Recharge a cylinder only if less than 5 years have passed since its last hydrostatic test date. The only exceptions are 3A and 3AA cylinders having water capacities under 125 pounds, for which a 10-year hydrostatic test frequency is approved. For fire extinguisher and fire extinguishing system cylinder hydrostatic test requirements, see NSTM Chapter 555.

(4) If there is evidence of oil or grease above the neck ring, do not recharge oxygen cylinders.

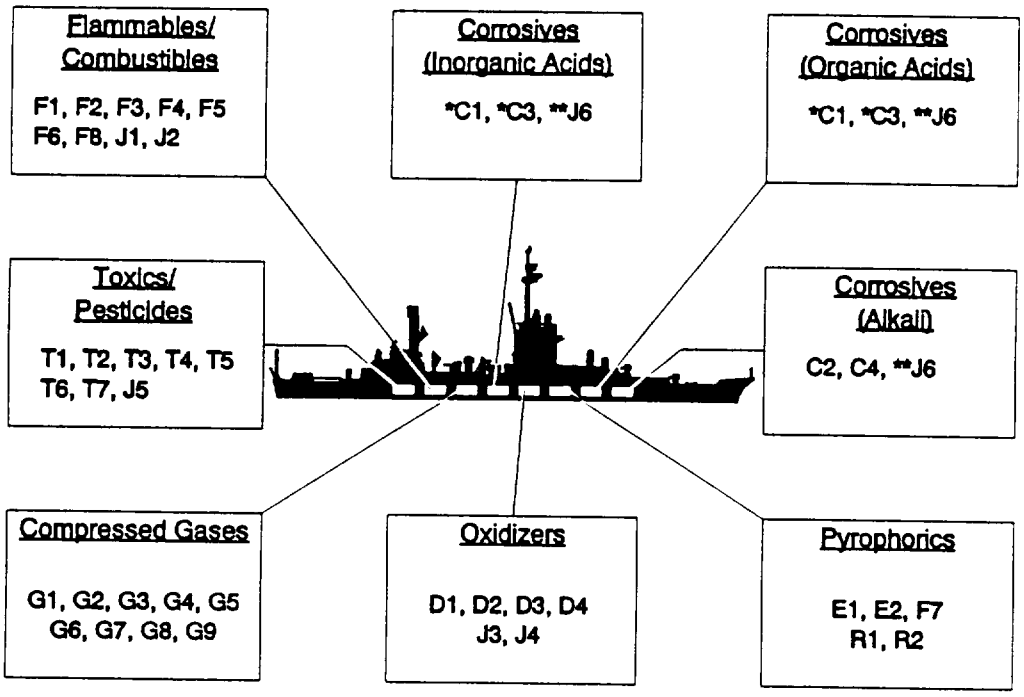
(5) Before recharging, sniff-test each cylinder for evidence of contamination by a foreign gas. Oxygen and oil-free nitrogen cylinders should be odorless. An oily odor from these cylinders indicates hydrocarbon contamination. Do not recharge contaminated cylinders.

(6) Keep shipboard oxygen cylinders (aviators' breathing oxygen) and nitrogen cylinders dry by not allowing the cylinder pressure to go below 25 lb/in^2g. Consider a cylinder wet if there is insufficient internal pressure to cause a hissing noise when the valve is opened.

Appendix C23-A

HAZARDOUS MATERIAL COMPATIBILITY STORAGE DIAGRAM
(USING HMIS HAZARD CHARACTERISTIC CODE (HCC))

The Hazardous Characteristic Code (HCC) for each SHML item can be found (A
in the Hazardous Material Information System (HMIS). The HCC and their intended use are defined and explained in 5100.19C, Volume I, Appendix B3-E.



Instructions:

1. Each block represents a separate stowage location. The codes in the the boxes are grouped with other codes with which they are compatible for storage. Generally, materials with different codes will not be stowed together unless specified below:

a. Inorganic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.

b. Organic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.

NOTES:

*C1, C3 - HM identified with the C1 or C3 code may be either an inorganic or an organic acid. See page C23-A-2 for examples of inorganic and organic acids.

** J6 - HM identified with J6 may be an inorganic acid, organic acid, or alkali. See page C23-A-2 for examples of inorganic/organic acids and alkalies.

2. All aerosol containers shall be stowed as flammable material.

Appendix C23-A

ACID AND ALKALI EXAMPLES

The table below lists commom examples of inorganic acid, organic acid, and alkali. Acids identified with the HCC code C1 or C3 may be either inorganic or organic, check carefully before storing. HM items with HCC code J6 may be an inorganic acid, an organic acid, or a alkali; check carefully before storing.

Inorganic acid (C1, C3, J6)	Organic acid (C1, C3, J6)	Alkali (C2, C4, J6)
Alodine	Acetic acid	Ammonia
Aqua fortis	Citric acid	Ammonium hydroxide
Boric acid	Cresol	Barium hydroxide
Chromic acid	Cresylic acid	Calcium hydroxide
Hydrochloric acid	Glacial acetic acid	Caustic soda
Hydrofluoric acid	Oxalic acid	Caustic potash
Muriatic acid	Sulfosalicylic acid	Diethylenetriamine
Nitric acid	Trichloroacetic acid	Lithium hydroxide
Oil of Vitriol (sulfuric acid)	Vinegar	Monoethanolamine
Orthotolidine solution		Morpholine
Phosphoric acid		Potassium carbonate
Sodium bisulfate		Potassium hydroxide
Sulfamic acid		Soda lime
Sulfuric acid		Sodium sulfide
		Sodium hydroxide
		Sodium metasilicate
		Sodium phosphate
		Sodium silicate
		Sodium hypochlorite
		Tetraethylenepentamine

CHAPTER C24

CO_2 FIXED FLOODING SYSTEM SAFETY PRECAUTIONS AND PROCEDURES

(A

C2401. DISCUSSION

a. This chapter contains basic safety precautions that must be observed to protect personnel from harm from CO_2 fixed flooding systems. Operating manuals and Planned Maintenance System (PMS) Maintenance Requirement Cards (MRCs) should be consulted for complete safety precautions related to specific items of equipment.

b. The procedures and precautions in this chapter should be followed whenever corrective or preventive maintenance work is performed inside or outside a space protected by a CO_2 fixed flooding system. This includes work on the CO_2 fixed flooding system and in the immediate area of manual or electrical controls for the system.

c. This chapter discusses the health hazards of CO_2, general safety precautions, and procedures for disabling CO_2 fixed flooding systems, for general maintenance and for rescue personnel.

d. Carbon dioxide (CO_2) is a colorless, odorless gas that is naturally present in the atmosphere at an average concentration of 0.03 percent. It extinguishes fires at high concentrations by reducing the concentration of oxygen to the point that combustion stops. Concentrations of CO_2 in the range of 30 to 70 percent are needed to extinguish fires.

e. Carbon dioxide for fire fighting is stored as a liquid at high pressures. Upon discharge into a protected space, most of the liquid flashes to vapor and the rest forms fine, dry ice particles.

C2402. HEALTH HAZARDS OF CARBON DIOXIDE

a. Carbon dioxide is 1.5 times heavier than air, and will collect at low points. Unless forced ventilation is provided CO_2 will remain in the protected space and may migrate to adjacent spaces, especially if they are lower than the protected space. Ship's personnel should be aware of this whenever they approach a room in which the CO_2 has discharged.

b. If CO_2 concentrations are greater than 30 percent, loss of consciousness will occur within half a minute. As the concentration increases further, cardiac arrest, brain damage due to lack of oxygen, and even death might occur. The body reacts to concentrations less than 10 percent by rapid and deeper breathing, headaches, and vomiting.

c. Tests have shown that within 2 seconds of actuation of a CO_2 fixed flooding system within a protected space, visibility is obstructed and within

3 seconds enough pressure has built up to prevent inward swinging doors from being opened.

C2403. **SAFETY PRECAUTIONS**

a. Personnel performing work inside CO_2-protected spaces without a CO_2 system time delay, shall ensure that inward swinging access doors are blocked open by a positive means, such as a C-clamp rigidly attached to the frame or door, to provide a minimum opening of six inches.

b. Ensure that the following safety precautions are followed when working on the CO_2 system **INSIDE** a CO_2-protected space with the CO_2 system functional:

(1) Do not begin work on a CO_2 fixed-flooding system until a safety briefing has been given to all personnel involved in the maintenance work, the assigned rescue personnel, and persons in areas susceptible to CO_2 leakage.

(2) Verify that CO_2-protected space ventilation is in operation.

(3) Evacuate all personnel from the CO_2-protected space except those directly associated with the maintenance work. Evacuate all non-essential personnel from areas susceptible to CO_2 leakage.

(4) Identify and be familiar with an escape path from the protected space and areas susceptible to leakage of CO_2 to a safe haven not susceptible to CO_2 leakage.

(5) Verify that doors or hatches to the CO_2-protected space and from areas susceptible to CO_2 leakage are blocked open and hatches or doors on the way to a well-ventilated space or to the weather are blocked open.

(6) Post temporary danger signs to warn personnel of the hazard and temporary warning signs to limit access to the CO_2-protected space and spaces susceptible to leakage of CO_2. These signs should have lettering of at least 1 inch high. Danger signs shall include the words, "DANGER - CARBON DIOXIDE GAS - WHEN ALARM SOUNDS - VACATE IMMEDIATELY." Post signs at the accesses to CO_2-protected spaces, inside the protected space, and inside all spaces susceptible to CO_2 leakage.

(7) Ensure all personnel inside CO_2-protected spaces wear operating OBA's.

(8) Verify that all personnel in spaces susceptible to leakage of CO_2 have EEBD's immediately available.

(9) Ensure rescue personnel are assigned, equipped, and located per paragraph C2406. Rescue personnel shall maintain a count of personnel inside the CO_2-protected space.

c. Ensure that the following safety precautions are followed when working on the CO_2 system **OUTSIDE** a CO_2-protected space with the CO_2 system functional:

(1) Follow the procedures listed in paragraph C2405c for work done inside the CO_2-protected space with the exception of the following differences concerning the escape path procedures.

(a) Verify that the doors and hatches to the CO_2-protected space are closed.

(b) Verify that the doors or hatches in the escape path are blocked open.

d. The alarm systems should be tested within the guidelines provided by the PMS cards.

e. Be aware that pull-cable actuation systems can be actuated by any movement of the cylinder or of the pull cable.

f. Be aware that the seawater sprinkling system controls look similar to components of the CO_2 fixed-flooding systems.

g. Be aware that CO_2 can be discharged from CO_2 bottles if they are dropped and their discharge heads become damaged.

h. Take precautions to not accidentally rotate the CO_2 cylinder in its brackets, thereby putting tension on the actuation cable.

i. Follow PMS procedures carefully during the process of removing and installing discharge and control heads to avoid accidental discharge of CO_2.

C2404. GENERAL PROCEDURES DURING MAINTENANCE WORK

a. Ensure that the Damage Control Assistant (DCA), the Engineering Officer of the Watch (EOOW), cognizant Department Head, and the Officer of the Deck (OOD), when underway, or the Command Duty Officer (CDO), Duty Engineer, cognizant Department Head, the Officer of the Deck and Damage Control Central, when in-port, are notified and requested to be ready to respond immediately in case of an emergency before the work starts.

b. Ensure that all personnel directly involved follow tag-out procedures, including tag-out of all locations from which CO_2 discharge can be actuated.

c. The cognizant Division Officer shall verify that all ship maintenance personnel involved in maintenance on CO_2 fixed-flooding systems meet the applicable Personnel Qualification Standards and that knowledgeable, qualified supervision has been assigned.

d. Ensure that any actuation of a CO_2 discharge alarm, either audible or visual, is investigated. An alarm that continues longer than one minute is abnormal and should be immediately investigated.

e. When corrective or preventive maintenance work is being done on the CO_2 system, normal space functions and other maintenance work shall not be permitted in the CO_2-protected space.

C2405. DISABLING PROCEDURES

a. Always disable CO_2 fixed-flooding systems by removal of the discharge heads and removal of the CO_2 cylinder control head, when installed.

b. Ensure that the period of time that a CO_2 fixed-flooding system is disabled is limited whenever flammable material is in the CO_2-protected space.

c. Backup flammable liquid fire fighting capabilities (such as an acqueos film forming foam (AFFF) hose or a seawater hose with a 5 gallon can of AFFF concentrate and a portable eductor) shall be established during the period the CO_2 system is disabled.

d. Fire watches shall be established during the period that the CO_2 system is disabled.

C2406. RESCUE PERSONNEL PROCEDURES

a. Ensure that a minimum of two rescue personnel are assigned. Additional personnel should be assigned when more than four maintenance personnel are present using a ratio of one rescue person for each two maintenance personnel.

b. Rescue personnel shall be located at or near the access to the CO_2-protected space in which the maintenance work is being performed or in the area in which the work is being done outside the CO_2-protected space and shall be positioned such that maintenance personnel and space/area conditions can be monitored.

c. One rescue person shall have communications, such as a sound-powered phone, with a manned location such as D.C. Central, Main Control, the Quarterdeck, or the Bridge.

d. Assigned rescue personnel shall be capable of providing cardiopulmonary resuscitation (CPR).

e. Once accidental discharge of CO_2 has occurred, rescue personnel should do the following:

(1) Inform DC Central, Main Control, and Quarterdeck or Bridge of emergency and request assistance, including medical assistance.

(2) Help maintenance personnel escape.

(3) Count personnel leaving area to assure all personnel have departed.

(4) Search for personnel who have not departed and assist them to escape.

(5) Verify that space in which CO_2 is dumped is free of personnel and then close the access door or hatch to reduce spread of CO_2 to other areas of the ship or space.

(6) Proceed to a safe haven.

(7) Perform CPR on any personnel that requires help until assistance arrives.

(8) Report status of escape to operating station.

(9) Start ventilation to space.

f. Rescue personnel shall wear personal protective equipment appropriate for entry into IDLH atmospheres (refer to paragraphs B0610(a) and (d)).